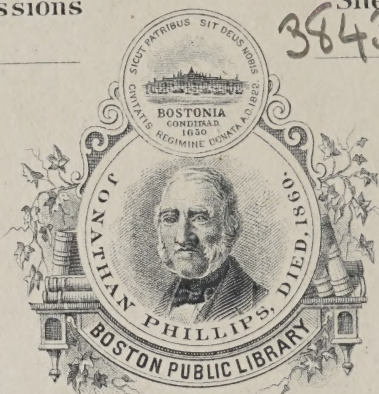


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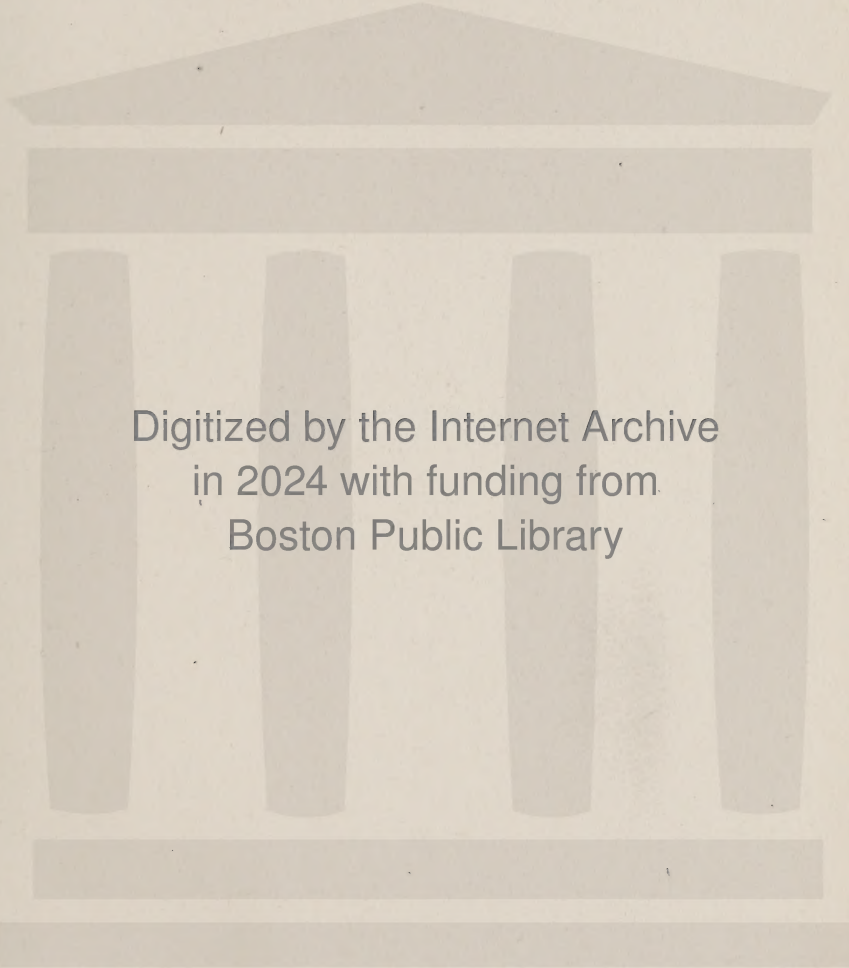
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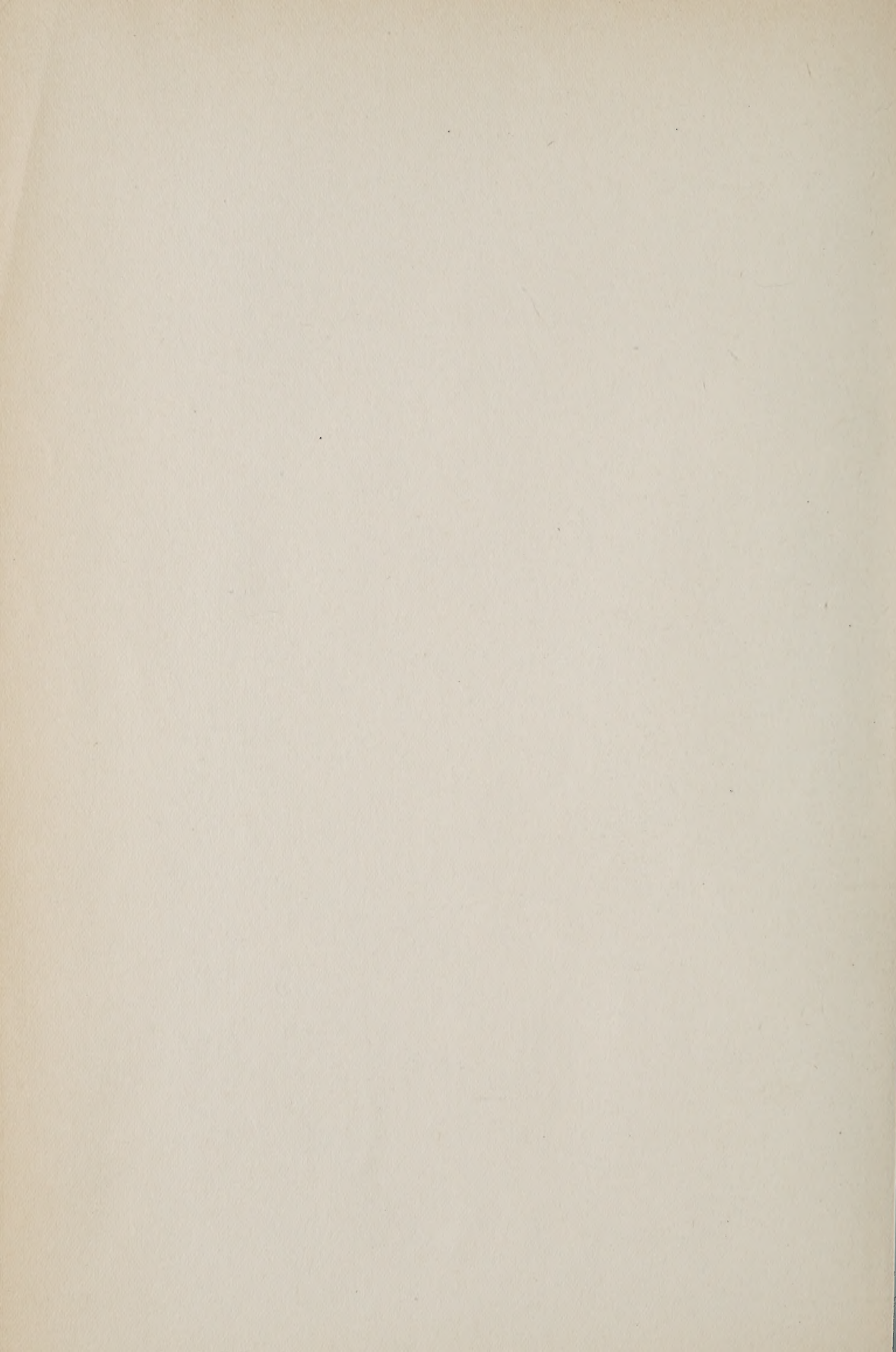
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BRITISH SEA-WEEDS.



1.—*Sargassum vulgare*, Ag.



2.—*Sargassum bacciferum*, Ag.



3.—*Halidrys siliquosa*, Lyngb.



4.—*Cystoseira ericoides*, Ag.

BRITISH SEA-WEEDS.

DRAWN FROM

PROFESSOR HARVEY'S "PHYCOLOGIA BRITANNICA."

WITH DESCRIPTIONS,

AN AMATEUR'S SYNOPSIS, RULES FOR LAYING OUT SEA-WEEDS,

AN ORDER FOR ARRANGING THEM IN THE HERBARIUM,

AND AN APPENDIX OF NEW SPECIES.

By MRS. ALFRED GATTY.

VOLUME I.



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CONTENTS.

	PAGE
INTRODUCTION	vii
RULES FOR PRESERVING AND LAYING OUT SEA-WEEDS . .	xxi
THE AMATEUR'S SYNOPSIS	xxx
LIST OF FAMILIES, GENERA, AND SPECIES, IN THE THREE COLOUR GROUPS, FOR ARRANGEMENT IN THE HERBARIUM . .	xxxviii
ALPHABETICAL TABLE OF GENERA AND SPECIES	xlvi
DESCRIPTIONS OF THE ILLUSTRATIONS	1

INTRODUCTION.

“Come unto these yellow sands,
And there take hands——”

EVEN the happy people of whom the strange phrase is used, that “money is no object to them,” cannot command fate altogether. They are mortal in respect of their minds; and cannot, with all appliances, get away from the inexorable law which rules that whoever would find the world interesting must work out an interest in it for himself. Much may be done, it is true, by unlimited wealth, to stave off the hour of *ennui*, but nothing answers so effectually as a healthy, earnest employment, whether of body or mind. Everything but what a man labours for becomes wearisome to him after a time—a cherished occupation never; for although on some particular day he may have tired himself in its pursuit, the object pursued is as dear to him as ever, when the next morning’s sun wakes him from the blessing of rest to the still higher blessing of exertion.

It may seem strange to open an introduction to a set of sea-weed descriptions with a somewhat trite moral reflection, but it has its particular mission in this particular case. It justifies the labour to which the book calls its readers, as well as that which the writer has gone through; and holds out to the former the encouragement of hope that their trouble will not be thrown away.

It was once prettily said by a lady who cultivated flowers, that she had “buried many a care in her garden;” and the sea-weed collector can often say the same of his garden—the shore; as many a loving disciple could testify, who, having taken up the pursuit originally as a resource against weariness, or a light possible occupation during hours of sickness, has ended by an enthusiastic love, which throws a charm over every sea-place on the coast, however dull and ugly to the world in general; makes every day spent there too short, and every visit too quickly ended. Only let there be sea, and plenty of low, dark rocks stretching out, peninsular-like, into it; and only let the dinner-hour be fixed for high-water time,—and the loving disciple asks no more of fate. Turn him out on that flat, and, to you (O Gentile of the outer courts), *uninteresting* shore, with a basket, a bottle, a stick, a strong pair of boots (oiled, not polished with blacking), and, let us add, to crown the comfort, a strong, friendly, and willing, if not learned companion; and all the crowned heads of Europe may be shaken without his being able to feel that he cares. When the returning tide has driven him backwards from his best hunting grounds, and sent him home at last to dinner and things of the earth, earthy, the squabbles of nations may come in for a share of his attention perhaps; but, even then, only imperfectly, for the collected treasures have to be examined and preserved, and the heart of the collector yearns after them.

Does any one doubt the truth of this picture, and imagine it merely a fancy description got up to throw a fictitious charm over the subject of the book? If he does so, let him undeceive himself at once. Fictitious extasies inevitably betray themselves, and he is no Lavater of the mind who can suspect that this is one. On the contrary, it is but a very poor transcript of the delight which hundreds have experienced already in this as in other investigations of the wonderful works of God; and it is to be hoped that hundreds will experience it again. Youth is not necessary to it, riches are not necessary to it, and a moderate amount of bodily health and strength will suffice, and will, in many cases, increase with the using; or the able and willing assistant-hunter may save the elder one a part of the bodily labour, and receive a more than double amount of good in return, as the two sit together on a rock for rest and pleasant discourse on things of Heaven and things of that Earth which the Almighty has given to the children of men, not merely as a picture-book to be stared at, but as written pages to be read and studied.

About this shore-hunting, however, as regards my own sex (so many of whom, I know, are interested in the pursuit), many difficulties are apt to arise; among the foremost of which must be mentioned the risk of cold and destruction of clothes. The best pair of single-soled kid Balmoral boots that ever were made will not stand salt water many days—indeed would scarcely “come on” after being thoroughly wetted two or three times in succession—and the sea-weed collector who has to pick her way to save her boots will never be a loving disciple as long as she lives! Any one, therefore, really intending to *work* in the matter, must lay aside for a time all thought of conventional appearances, and be content to support the weight of a pair of boy’s shooting boots, which, furthermore, should be rendered as far water-proof as possible by receiving a thin coat of neat’s-foot oil, such as is used by fishermen—a process well understood in most lodging-houses. It is true that sea-water does not usually give any one cold, but in sea-weed hunting, where there is so much standing and dawdling about, as well as walking, it is as well for beginners or delicate people not to be wet for any great length of time; and as for the hardier hunters who have learned to walk boldly into a pool if they suspect there is anything worth having in the middle of it, they will oil their boots, for the simple reason that it is a mere waste of time to black and polish them; for, polish as they will, a saline incrustation is sure to steal through at last. This advice cannot be enforced too strongly. It is both wasteful, uncomfortable, and dangerous to attempt sea-weed hunting in delicate boots. Wasteful, because a guinea pair will scarcely last a week. Uncomfortable, because to walk on some rocks in thin soles (the slate edges of those in Douglas Bay, for instance) is so painful, that it very soon becomes impossible. Dangerous, because you must be wetted through by the first bit of moist sand you come to, and it is not every one who would be justified in running the risk involved in this fact.

Next to boots comes the question of petticoats; and if anything could excuse a woman for imitating the costume of a man, it would be what she suffers as a sea-weed collector from those necessary draperies! But to make the best of a bad matter, let woollen be in the ascendant as much as possible; and let the petticoats never come below the ankle. A ladies’ yatching costume has come into fashion of late,* which is, perhaps, as near perfection for shore-work as anything that could be devised.

It is a suit consisting of a full short skirt of blue flannel or serge (like very fine bathing-gown material), with waistcoat and jacket to match. Cloaks and shawls, which necessarily hamper the arms, besides having long ends and corners which cannot fail to get soaked, are, of course, very inconvenient, and should be as much avoided as possible; but where this cannot be, a good deal may be done towards tucking them neatly up out of the way. In conclusion, a hat is preferable to a bonnet, merino stockings to cotton ones, and a strong pair of gloves is indispensable. All millinery work—silks, satins, lace, bracelets, and other jewellery, &c. must, and will, be laid aside by every rational being who attempts to shore-hunt.

A stick was alluded to before, and is a very desirable appendage, both as a balance in rock-climbing and for drawing floating sea-weeds from the water. It should have a crook for a handle therefore. But about these sort of matters, people should amuse themselves by devising ingenious varieties. The basket may be lined with gutta percha, or exchanged, by those who care to invest in it, for an Indian-rubber bag, which can be strapped round the waist, and into an inside pocket of which a bottle or two for the more delicate sea-weeds may be easily stowed away. But the common basket which has served the bygone generation will do very well for any one who is in earnest in this. Few tools come amiss to a good workman, and it argues a rather *dilettante* state of mind to insist on having everything the perfection of convenience. Into which question comes also that of expenditure; and the reader is here assured, once for all, that it is quite possible to go shore-hunting for life quite comfortably without any extra expense whatever; that *very* strong-soled pair of boots perhaps alone excepted, and they will be found quite as useful in country walks afterwards, as on the sands.

Equipped, therefore, with as much woollen in the dress as possible, let us imagine a pair of friends starting for the shore. But they must never do so without ascertaining from more than one inquiry the real state of the tide. It sounds like a joke to say that a sea-weed collector should always order his dinner at high-tide hour, but the idea is a very good one, and, were there none but sea-weed collectors in a company, might be (under limits) carried out every day. Nevertheless, as there are plants well worth having, to be found near high-water mark, these can be looked for on the days when low-water occurs at dusk, or in the too early morning. All that is insisted upon here is, that no one should venture upon the shore among rocks, the ins-and-outs of which it needs long experience to understand, without ascertaining whether the tide is ebbing or flowing. A flowing tide often steals round the back of perhaps a pretty extensive field of low rocks instead of advancing straight over them, and in that case it is very easy to be surrounded before one is aware. A steady determination to wade and not be frightened is then the only resource; but the evil is better avoided, and this can be done by a little care and watchfulness. Both are necessary, however, and no enthusiasm must cause this fact to be forgotten. A casually-overheard remark, that a certain bay in the Scilly Isles was "deceitful," induced a late visitor there to be more than usually vigilant, although it was impossible by looking over it to detect where the danger lay. But when the tide had flowed for about a couple of hours it became evident that it was making a circuit, following an unobserved lower level among the rocks, and that a considerable portion of the hunting-ground would presently be left an island; high and dry itself for several

hours probably, but not very easy to get away from, when climbing over boulders had to be combined with striding knee-deep in water. This was the Windmill Bay at St. Mary's, Scilly; and it is but one case among hundreds, for even flat sand-bank shores are not safe without attention, as any one who knows Withernsea, near Hull, will bear witness. Enough, however, of warnings, lest people should be frayed from venturing on the shore at all; whereas our hints are only intended to teach them to do it safely.

And once on the beach under the favourable circumstances of a fine day, a receding tide, sufficient refection in the basket to prevent an inglorious retreat for lack of food—what is the wisest course to pursue? To go straight down at once to as low-water as the tide admits of, and so gradually follow its retreat; or to indulge the very natural inclination to stop and gather the wash-up (*wreck*, or *wrack*) which may possibly be scattered at your feet? The answer depends upon circumstances, but, as a general rule, the first is decidedly the better plan for a sea-weed collector. Sunshine so quickly injures the greater number of the finer plants (fading them to yellow and white), that they are scarcely worth picking up after a few hours' exposure. But if a rough sea has brought an unusually profuse and thick deposit, they are well worth a turn over or two from your stick just to see that you are not leaving pearls behind you unaware; and if you are one of those who patronise zoophytes as well as algæ, you are pretty sure to find something worth stopping a few minutes for. Very good zoophytes are sometimes washed up to the very last high-water mark line, an instance of which once occurred at Filey, where a layer of the scarce *Thuiaria articulata* was left round one side of the bay, close under the cliffs.

In such cases, of course, the bird-in-the-hand principle must come into play. You must not leave the certain good thing behind you, lest you lose it; for, find what you may afterwards, you will fret about the neglected treasure. Secure it, therefore, but hurry on afterwards; and to beginners I would say, Go down to lower water at once.

And now, if you have to walk along the sands before reaching the rocks you purpose scrambling over, enjoy yourself thoroughly as you go, by keeping close to the sea; never minding a few touches from the last gentle waves as they ripple over at your feet. *Feel* all the luxury of not having to be afraid of your boots; neither of wetting nor destroying them. *Feel* all the comfort of walking steadily forward, the very strength of the soles making you tread firm—confident in yourself, and, let me add, in your dress. Verily we women are all, "more or less" (as sea-weed descriptions have it), at the mercy of our dress! It is an unpleasant truth, but a truth it is. Does it not require an actual effort of moral courage, for instance, to go to a dinner-party, when you know that *you* are by no means fresh from the hands of a milliner, but that other people are likely to be pre-eminently so? Can even a sense (which shall be granted you) of some internal compensating superiority prevent you feeling a little—just a little!—abashed, or "*dashed*," as the strong common phrase goes, by the consciousness that for you the last new moon's "Belle Assemblée" has been published in vain? Take courage and admit the fact! You may hate the particular fashion of the day; disapprove of it as a matter of taste; be quite aware that no artist, or, at all events, no high-art artist, would venture

to disfigure his canvas by a representation of such Guy-dom. But yet——

“My Lord! we women swim not with our hearts,
Nor yet our judgments, but the world's opinions.”

Well, well! “Pelham” said long ago that the world considered eccentricity in small things, folly; in great ones, genius. So a woman is right in not dressing differently from the world's opinion when she is in the world, if she can; and when she cannot she must bear the mortification like the heroine she is: for among women there are a good many heroines of whom the world knows nothing. But enough! Enough, too, that if costumed as I have described, you, loving disciple, are, at any rate for once, conscious as you step along, that you are in the right dress in the right place; that you could not walk where you are now walking but for *it*; and that to walk where you are walking, makes you feel free, bold, joyous, monarch of all you survey, untrammelled, at ease, at home! At home, though among all manner of strange, unknown creatures, flung at your feet every minute by the quick succeeding waves. Curiously fragile, paper-like, sea-urchins—you wonder if alive or dead—some mere empty cases, some heavy with the corpse within; jelly- and star- fishes; ridiculous little crabs, who find their legs at once, and trot hurriedly off; and mixed with these, perhaps, the heavy body of a once beautiful sea-gull, its life cut short by an idle shot; and a thousand other things which must not be named or numbered here; for, if you are a sea-weed collector only, you will not care to be troubled about sponges, zoophytes, or shells, nay, probably would not even notice them, for it is curious how the eye accustoms itself to see what it is searching after, and to ignore everything else. Any mother knows this who has walked down a wooded lane in spring with a schoolboy son. To her it is full of primroses, violets, and such matters; to him of the birds' nests which, even when pointed out, she can scarcely distinguish in the thick green hedge. “None so blind as those who won't see,” except, perhaps, those who are looking for something else.

But probably, as you proceed in your walk, you will observe that more and more sea-weeds are being left among the creatures on the sand, and, if so, by all means examine the nature of the wash-up before you pass on. If you see chiefly large lumps of the olive-coloured *Fuci*, such as are figured in the first four Plates, you need not trouble yourself. Pursue your way. But if delicate little tufts, pink or brown, are lying about, secure a few of each sort as nearly as you can guess at them, before you proceed. The initiated will, of course, have a definite idea of what to gather in such a case, and so will you—and soon become one of them—if you will now on this first occasion keep your random gatherings by themselves, so that on your return you may notice what it was you picked up. It is possible that all your little tufts may be but one species—that very common *Ceramium rubrum* (Fig. 242), which is a sort of Paul Pry in sea-weed society, intruding himself everywhere in many varieties of appearance. Or they may be altogether a mass of another common thing, *Plocamium coccineum* (Fig. 178), for as it looks very pink as it lies, you would be certain to pick it up, were it there. And sea-weeds are so often torn from the rocks in shoals, that it is very common to find a quantity of specimens of one thing together; and as only an experienced eye can detect a species as it

lies in a lump on the sand, beginners are sure to pick up more of a kind than they want. No matter, however, for your first gatherings, if you do but observe them narrowly afterwards, and so take in a lesson of increased wisdom for next day.

Moreover, "time and chance happeneth to all men," and your very first day's hunt may, by a happy accident,—waft actual treasures under your eyes. It is in vain to attempt to enumerate these, but let no very delicate hair-like tuft or flat pink plant escape you; watch the wave that is throwing them ashore, and if it is for changing its mind and drawing them back, you must step in to the rescue and secure what looks to you the best, whether you wet your gloves, boots, or even petticoat, or not! And then push on, for if good things are astir in this manner you will get at them still more easily a little further down; kneeling on some low rock for instance, in some sheltered corner which you must look for, where the water is tolerably quiet, and you can see your pretty prey floating, displayed to the best advantage, and dip in a bare arm to catch it at comfortable leisure.

And here men have certainly an advantage over women, for they can wade with impunity: but never mind; plenty can be done without it, if the loving disciple will but have patience with the waves, use her stick cleverly to assist the nearing of the plants, and separate them so as to observe their forms as they approach. She will thus soon learn to know the fairy *Callithamnion* bushes (Plates LVI. to LIX.) from everything else, and will push aside the coarser Paul Pry, *Ceramium rubrum*, for their more refined tufts; nay, could scarcely fail to recognise *Chrysomenia rosea* (now *Chylocladia rosea*, see Fig. 142) itself, even at first sight. But patience and enjoyment must go hand in hand here. To stoop down once or twice and then be weary, will not do. You must kneel, or sit, or recline on the rock, and fairly gaze on into the water as the waves waft the plants up and down. And if you have got into a good place, *i.e.* under shelter, and where fresh things are coming in, half an hour will scarcely be too much to remain, unless the tide is ebbing, in which case you must follow it to the next convenient resting-place.

Of course, to gather a plant growing in the orthodox perfection of sea-weed discovery, but these hints are especially intended for the comfort of the sisterhood who are hampered both in wading and climbing. And they may rest assured that some of the rarest and loveliest plants may be caught in the manner above described, and often as perfect and uninjured as if careful hands instead of reckless waves had detached them from the rocks. The truth is, the scarce low-water plants are apt to haunt very inaccessible places; places, too, where the roaring of breakers is so near at hand, and the standing ground so wet with spray, that a strong mental effort is necessary to keep the nerves and feet steady, even after the difficulties of getting there are surmounted. Not that the spot is unsafe for any one who is sure of a continuous self-command; but invalids sometimes become sea-weed collectors, and it would be madness to counsel women indiscriminately to be strong-minded above their condition. People can, however, do at one time what they cannot at another; and with a male companion to lend a hand and infuse a sense of security, a very *eerie* hunting-ground may be sometimes ventured upon; yea, even within the splash and uproar of such heavy dark green waves as beat against the north side of Filey Bridge, the place of all others to which the above remarks specially refer.

But "unprotected females" have no business to be running risks for the sake of "vile sea-weeds;" and, for their consolation be it known, that although that bewitching *Chrysomenia rosea* lurks in just such fearful corners, only attainable at spring-tides, and only uncovered then for a very short time, yet as fine a specimen as has ever been found of it was floated into a shallow tide-pool that formed round a large stone on the sands of Filey Bay!

But having said thus much for the happy chances which often attend *wreck-gathering*, as distinguished from *rock-gathering*, it is fair to add, that all low-water hunting-ground is not of the same inaccessible character. In flat open bays and shores, with rock-fields of moderate height, you have only to look out for not being surrounded by back-water, and may, if you are indifferent to noise and dreariness, prowl up and down the fruitful wet lanes that lie between the different masses, to your heart's content. Of this kind is the glorious coast to the north of Berwick-upon-Tweed, where hundreds of collectors might work together without ever interfering with each other, so great is its extent; and where, when beaten back by the tide, you find extensive upper caves, into whose shadowy pools the wreck has been floated unscathed and unfaded, and where you may pick it out for another hour or two longer. Into these caves come from time to time the tiny fronds of the scarce *Rhodymenia cristata* (now *Euthora cristata*, Fig. 184), as dear to an algologist's eye as a nugget of gold.

And somewhat of the same character (the caves excepted) is Gristhorpe Bay, between Scarborough and Filey, where (all but back-water) the only risk you can run, is of slipping by a false step into some of the enormous pools with which it abounds, and which are deep, though not always dangerously so. But there are such things as *happy accidents*, and it was a tumble into one of these sea-weed repositories which a few years ago revealed the then rather surprising fact, that the whole bottom of the pool was lined with fine large plants of *Odonthalia dentata* (Fig. 99); a species at one time supposed to flourish no farther south than the county of Durham. A "happy accident" this, were it only for the assurance it gives of how much remains to be done in the exploration of different localities!

But even in reflecting upon the best and easiest shores, such as the choice one of Douglas Bay, Isle of Man, for instance, it must be owned that a low-water-mark expedition is more comfortably undertaken under the protection of a gentleman. He may fossilize, or sketch, or even (if he *will* be savage and barbaric) shoot gulls, though one had rather not; but no need, anyhow, to involve him in the messing after what he may consider "rubbish;" unless, happily, he be inclined to assist.

Meanwhile let the loving disciple who cannot obtain such help, take things easy. It is a fine thing to get as far as you can, of course; but she will do sufficiently well, as has been shown, without straining the point. We could whisper to her of a shore and pools at St. Mary's, Scilly, where, without running into hazards or among *Laminaria* plants, she may deck herself over from top to toe with the crimson fronds of *Rhodymenia laciniata* (now *Callophyllis laciniata*, Fig. 179) and *Kallymenia reniformis* (Fig. 215), or the lighter rose-coloured ones of *Nitophyllums Hilliæ* and *punctatum* (Figs. 175, 174); even as the robins covered over the babes in the wood with leaves! And really, as a general rule, it would be scarcely possible to say that

she has less chance of success in "treasure trove" from wreck-gathering on the shore, than more adventurous labourers from low-water-mark researches.

The long mass of rocks called Filey Bridge has been already mentioned; and one of its peculiarities, namely, its various *levels*, leads to a subject to which the attention of collectors should be directed; that is, the *zone vegetation of the sea*. By which is meant that certain particular plants, and even classes of plants, affect certain depths or levels of the sea. Thus, for instance, one may say generally that the grass-green ones inhabit the upper range or zone, and that the red prefer the lower, while different forms of the olive-coloured flourish the whole way through. In the following descriptions this point is always noticed; and it will be observed that, while some species confine themselves exclusively to one situation, others are to be found anywhere "between tide-marks;" varying, however, considerably in colour and even character of growth in different situations; the red ones always pale and discoloured near the higher zone. Thus, in upper pools, our friend *Ceramium rubrum* will be found a dirty stone-colour; in deep ones, a fine red.

Among those which maintain an unvarying position is the large Tangle or Oar-weed, *Laminaria digitata* (Fig. 24). It is never met with but at extreme tide-limits, where some of its broad, leather-like fronds may be seen darkly overhanging the rocks, while others, a little lower down, are rising and dipping in the water like sea-serpents floated by the waves. If ever you find yourself astray among *Laminarias*, therefore, you may conclude at once where you are, according to algological geography; namely, at extreme low-water mark; or, in other words, in the *Laminarian zone*. And, being there, it behoves you to remember that you may expect to find all manner of good things growing in the neighbourhood, seeing that the finest red sea-weeds also love this deep water. Not that you must expect to see this lower region a fairy land of rosy colour, remember—often not half as much so as a wreck-scattered shore like that at St. Mary's. A delusion on this subject is encouraged by picture-books, from which the loving disciple must awake. Few red plants are as bright when growing as when laid out, though this rule, like all others, has its exceptions; but it is true of most of the species which afterwards prove so brilliant. *Delesseria sanguinea*, for instance (now *Wormskioldia sanguinea*, Fig. 169), does not acquire its fine cactus-hue till after it has been exposed for an hour or two to the air; and *Dasya coccinea* (Fig. 135), and *Plocamium coccineum* (Fig. 178), take a longer time still before they change from their original reddish brown to the cochineal tint their name implies. To find the former plant, therefore, you must look out for a delicately transparent and exquisitely formed leaf, rather than expect to be guided to it at once by a startling blaze of colour.

Beside all which, the beauties, whether bright or dingy, often hide; and you will have to inspect the sides of the rocks most carefully, lifting up the great tangle plants to peep underneath them, if you would hope to see anything worth having. The most lovely of *Callithamnions* looks but a miserable little dab of pinkish mud, as you see it on a rock when the tide has left it, for how can it float and show itself there? And it is only by knowing and practically believing that everything is *something*, that you are preserved from passing by many such minute valuables in such situations.

In truth, with all due deference to bright pictures of deep sea-rocks, such Laminarian zone ground as one can get to, is often anything but attractive in general appearance. Nay, it is sometimes particularly dismal and gloomy-looking, owing to the masses of olive plants that abound there, and the saturated hue of the rocks. How it may be further down still, one cannot pretend to say. We shall know some day, perhaps, when *diving* for sea-weeds has become a fashionable amusement, and an indispensable part of an algologist's education, and collectors go forth singing,

"Come with me, and we will go
Where the rocks of coral grow."

But to return to our subject. When low-water mark affords you a long, flat, rocky level to walk upon, the case is decidedly better; for there you are sure to find pools, and some of these will be crystal basins, not thickly crowded and confused with plants, like those higher up, but exquisitely clean and refined, lined with a lilac-pink *Melobesia* incrustation perhaps, or graced at the bottom or sides by a few elegant tufts of, now and then, the exquisite little *Polysiphonia parasitica* (Fig. 128), or the deep green *Bryopsis plumosa* (Fig. 286), displaying their feathery forms to the best advantage. "*Exceeding in beauty the plants of the earth,*" exclaims Dr. Johnson, in a moment of enthusiasm, when speaking of the vegetation of rock-pools, at the conclusion of his *Botany of the Eastern Borders*. And the compliment has its value, though one knows the words were not intended to be taken *au pied de la lettre*.

Now, on leaving the Laminarian zone of Filey Bridge, you have the opportunity rarely afforded by one mass of rocks, of ascending gradually by a succession of, for the most part, square-cut levels, or ledges, each easy to walk upon, and abounding in pools, up to extreme high-water mark on the top; one part of which is only completely submerged at spring-tides, though always within the influence of spray. And here, as you walk over the fine old riddled surface, nearly a quarter of a mile in extent, you have but to turn to the right hand, where some large blocks of stone rise up in a sloping position, and underneath the slope you may gather handfuls of *Catenella opuntia* (Fig. 204), as you stand; while in the adjoining pools the grass-green *Enteromorpha*s (Plates LXX. and LXXI.) come, obedient to the zone law which gives them the upper level as their peculiar habitat.

Nor are the intermediate levels—hanging-gardens, as it were, of the sea—between high and low-water mark, difficult to be got at, if only you have remembered to put on a strong pair of gloves, and will condescend to use hands as well as feet to ensure your safety. But by this time there is no doubt the disciple will have become as reasonable as nature intended her to be—will have realised the wisdom of wearing woollen petticoats among wet rocks, and thick boots when she has to walk over beds of *Fucus vesiculosus* (Fig. 10), and *Himanthalia lorea* (Fig. 16).

As to the hanging-gardens themselves, they afford a good opportunity for a minute study of zone vegetation; but this is a subject for the more advanced student, who can open Dr. Harvey's works and follow him in this and other interesting discussions. And now, even among the pools, the old rule holds good—the prettiest things are not to be got at without trouble. The disciple will have to kneel or sit down on the

rock and lift up the coarser plants which often fringe the edge of such places, and look underneath for delicate *Corallinas* (Plates XXXIII., XXXIV.), *Polysiphonias* (Plate XXVI., &c.), and other scarcer things, or she will come away knowing nothing of the pools at all. But, alas! here is no space for fully pursuing this subject. Only remember that the perpendicular faces of rocks have their growths as well as the pools, and that a good collector must, like a good nurse, keep her eyes open all round her; while, on the other hand, the injunction cannot be enforced too strongly, that she had better go home hurriedly than overload her basket and spoil everything it contains.

It will be understood, of course, that what has now been said of Filey Bridge applies to other rocky shores, although the zones of growth are more easily observed there than elsewhere. But they exist everywhere—everywhere grass-green is the earliest life in the first vegetation-line; mixed gradually with some of the more delicate olive plants, *Ectocarpus* (Plates XIX. &c.), *Asperococcus* (Fig. 46), &c. Everywhere the *Laminarias*, and the rarer red plants, are to be found only at low-water level, but the popping sea-weeds, the *Fuci* (Plates III. and IV.), throughout the whole range, save only the extreme last. Exceptions excepted, an examination of any shore will prove these statements correct, and enable the collector to judge whereabouts she is, algologically speaking, on even a perfectly strange coast, and to regulate what she looks for, accordingly.

Another subject of interest to the algologist is the influence of climate on the growth of special plants, for this may often decide her in a choice of stations. Sea-water varies very much both in temperature and saltness, and it would be as unreasonable to look for Devonshire myrtles in Yorkshire gardens as for Devonshire algae in its waters. But here latitude is not everything. Douglas Bay, in the Isle of Man, is in nearly the same latitude as Filey, yet both the land and sea vegetation are very different; and if it be asked why, no reason can be assigned but *Gulf-stream influence*. The point is open to discussion and objection, perhaps; and there is a theory (with a diagram in its favour!) of a current which diverts the Gulf-stream from going further east than the Scilly Isles, and prevents its going up the Irish Channel at all, while it allows its influence on the west coast of Ireland. But if this be so, how is it that the blue snail shells (*Ianthina fragilis*) and Portuguese men-of-war (*Physalia pelagica* and *Velella spirans*), which it is universally admitted are drifted to Ireland and Scilly from hot latitudes by the Gulf-stream, are also found along the coasts of Cornwall and Devonshire? Surely this diverting current off the Scillies is rather a mythical idea? Moreover, it is not Captain Maury's belief, who figures his lines of influence as extending not only up the Irish Channel, but a few of them along the south coast of England and slightly north-east beyond, until lost in the stronger downward current from the North Seas.

People may adopt which theory they like best, but those who have seen the coast of County Clare, the Isle of Man, and the north-east shores of England, will have a strong leaning towards Maury's creed. It solves all the difficulties presented to them by the different appearance of the waters in those places, and the different vegetation to be found in them. Sea-weed collectors need only be told that *Sphaerococcus coronopifolius* (Fig. 191) exists at Douglas, and *Odonthulia dentata* (Fig. 99) at Filey, to be aware that there must be some very decided cause to account for

so great a difference in the growths of two places in the same latitude. And many other warm-sea-loving plants occur in the Isle of Man which are quite unknown on the north-east coast, as *Bonnemaisonia asparagoides* (Fig. 133), *Callithamnions plumula* and *thuyoideum* (Figs. 254, 275), *Naccaria Wiggii* (Fig. 218), *Chylocladia* (now *Lomentaria) kaliformis* (Fig. 146), *Griffithsia corallina* (Fig. 252), and who knows how many etceteras, if one could but get at accurate information?

A limited visit to one locality goes but a small way towards an acquaintance with its treasures; and it is to be wished that more was ascertained about that unusually charming island, with its soft climate, blue sea, bad farming, bare-legged, begging population, beautiful scenery, remarkable antiquities, and last, not least in love, its exquisite sea-weed shores.

Would that some one might take this hint! for if more efforts were made towards announcing individual experiences on different coasts, a large amount of testimony information would be secured, which at present dies out and is lost.

A few words remain to be said about the descriptions of the Plates which follow; the most important being an assurance to the reader that he is secured from the danger of meeting with serious errors, by the fact that private friendship has enabled me to consult Dr. Harvey from first to last throughout, as also to make use of his various works. Those works are intended for scientific or, certainly, *advanced* students, and any one who will compare his descriptions with mine will discover that what I have done—or rather what I have attempted to do—is to bring his scientific statements within the range of general comprehension by such alterations of language as might soften the technical difficulties which are such a stumbling-block to amateur beginners.

Should any one, from looking at these descriptions, desire to rise out of amateurship into science, he will seek and find his proper food elsewhere. The books are open for those who can understand them, and those will understand them who care sufficiently to try, and will find the pursuit a charmed one. So that to have assisted in whetting the appetite of any worthy disciple in favour of it would be a fact to reflect upon with pleasure, and make the labour bestowed on these pages seem well employed. And who can doubt that those who desire to take the higher flight, will be all the better able to do so from having condescended to begin as children, and work upwards by childish steps?

They may laugh hereafter, perhaps, at ever having looked at a book which translates *ramuli* into *branchlets*, and *ramelli* into *branchleteens*; but it will be in the same way that grown-up people smile at the spelling-book which enabled them to begin literature by stories of one-syllabled words. By the time my amateur beginners have learnt to know that *ramelli*, as *branchleteens*, are distinct from *ramuli*, as *branchlets*—have seen *threads* explained as *filaments* so often, that to forget what *filaments* mean is impossible, with other similar lessons—they will look at the pages of Phycologias, British and Foreign, with comparatively open eyes, and on their own heads will it be if they do not persevere further!

Moreover, it is believed that the plan here adopted, of arranging the *subjects* of observation in separate lines and in uniform order, will facilitate the necessary comparison of species with species. Thus, at a glance, *colour* can be matched with

colour, *substance* with *substance*, *form* with *form* (under the title *Character of Frond*), &c., and a plant referred to the one with which it proves to agree.

It is true, the absence of scientific *generic* classification and headings makes it difficult at first to discover to which *set of species* a plant may belong; but, to meet this difficulty, two attempts are now made; one of which is to throw brief *generic* and *specific* distinctions together in the descriptions. Thus, on the first page, in the account of the *Sargassums*, the statement that they have "branches bearing distinct leaves" is made of both, and is followed in both cases by a more particular description of the leaves. Now the fact of "bearing distinct leaves" is a *generic* character, and separates the *Sargassums* from all the other plants that follow; whereas the minute differences as to *width*, the presence of *pores* in the leaves, &c., are among the *specific* ones which distinguish *S. vulgare* from *S. bacciferum*.

So of the *Polysiphonias* (Plate XXV., &c.), the true *generic* characters, that they are *thread-like*, and that the threads are *jointed*, and that the joints are marked with *upright lines* (internal tubes seen through), are repeated under each species; while the *specific* distinctions as to the *number* of tubes visible, the more or less obscurity of the joints, and other matters, are added to each.

But, besides this, in the second place, there will be found appended to this volume a *Synopsis of Sea-weed Appearances*, which it is hoped will be a great assistance to the collector in tracing any plant he may meet with to its *generic*, and, finally, its *specific*, home. In this the *first* step towards algological classification is as clearly marked as in the most scientific works, viz. the division of algæ into three chief colour-groups,—olive, red, and grass-green:* but this stage over, scientific classification is laid aside, and the plants are grouped together by the more obvious characters of form and habit of growth. To begin at the beginning, however. The first inquiry of a collector must still be—Is my plant olive, red, or grass-green? And this he must find out whenever he wishes to ascertain its name. In most cases it will be easy enough to do so, but in others he can only accomplish it by holding up the plant to the light, or by examining through a pocket lens (a magnifying-glass used by all botanists, and to be carried in the pocket); or, better still, under the microscope. And here he must bear in mind that all algæ are coloured one of the three colours named, unless faded by exposure. The tempting white bits so common on the shore near high-water mark, therefore, are worthless, except to make a variety of appearance in a sea-weed picture or basket.

The colour ascertained, he now knows in which of the three colour-groups to look for his plant, and may proceed next to consider to which of the principal *divisions* of its group it belongs; whether to the FLATS, the CYLINDRICALS (*i.e.* those *shaped* like a thread, whether coarse or slender), the INCRUSTATIONS, or IRREGULAR LUMPS. Then—if flat, for instance—he must go on to observe whether it is *with or without a midrib*; whether *leaf-like* or *irregular* in shape; whether *branched* or *unbranched*, &c.; for it is impossible to do more here than give a general idea of *how* the inves-

* Not that the colour-groups are so arranged *because* of colour, but because of structure; consequently, in a few cases where colour and structure clash, colour gives way. Hence the exceptional *red* cases in the grass-green group, where the structure is strictly that of grass-green plants (Figs. 345 to 350).

tigations are to be pursued. They will need patient labour and careful observation; but if these are given they will probably be successful. What the *Synopsis* fails to give, the specific descriptions and plates will probably supply; and the List of *Families, Genera, and Species*, which follows, will enable the student to reduce his scattered materials into their proper order, and arrange his plants in the herbarium according to their scientific classification.

It is true the difficulties increase as the inquiry proceeds. It is easier to find the generic than the *specific* name of a plant; to trace it home to its family, than to identify it as an individual. But those who have accomplished the one are little likely to rest satisfied without attempting the other. And if a real difficulty occurs, surely some more advanced naturalist-friend can always be got hold of to throw light on the subject. For brotherhood is strong among them—especially among the highest—whose readiness to help the ignorant, even at the expense of much valuable time and trouble, is an example which all will do well to imitate. On the other hand, the “*ignorant*” should carefully guard from presuming on such good nature. A habit of recklessly sending unexamined specimens to be named—a dozen of one sort perhaps—cannot be too strongly deprecated. But a real difficulty, which the possessor of a plant has tried in vain to surmount, is sure to be kindly and considerately met by any one to whom reference is made.

Very little more remains to be said, except on the subject of *microscopic examination*. In the course of these descriptions, especially in the latter ones, certain characters of plants, or the plants themselves, are described as microscopic objects. And it was necessary to state this, in describing such species as are only distinguishable from each other when observed through a power of the microscope high enough to reveal internal structure (see Plates LXXVIII. LXXIX. and LXXX). A microscope, therefore, is one of those desirable possessions which almost amounts to a necessity, and is absolutely such to a student who intends to investigate thoroughly for himself. The internal tubes of a *Polysiphonia*, for instance (Plate XXV., &c.), cannot be seen without it, any more than the differences among *Lyngbyas*, *Microcoleus*, *Oscillatorias*, *Monormia*, &c. (Plate LXXVIII., &c.). And in days when an actually useful instrument may be had for 10s. 6d., and very good ones for a few pounds, it is to be hoped that few will be unable to afford themselves the luxury of such an assistant. For a luxury that is, indeed, which will so often resolve perplexing doubts by a glance, and save many weary hours of uncertain labour.

Connected with the microscope is, of course, the subject of examining plants by making sections of them. The Germans call a section a *durchschnitt*, or *thorough-cut*—expressively enough; and this *durchschnitting* is a necessary accomplishment to an advanced, *i.e.* a *scientific* student. Some *genera* even are wonderfully alike, till a *durchschnitt* reveals a difference in internal structure; when, behold, plants which might be taken for twin brothers have to be separated as wide as the poles, and the fructification of algæ can never be *understood* without such minute dissection. And although in these descriptions internal structure is not really entered into, except in cases which are visible by simple observation under a microscope, necessary allusions to it have been occasionally made,* which seem to render it desirable to

* As in the characteristics of Family XIV., *Squamariæ*, &c.

add a few hints upon the art of making *durchschnitts* properly. These, therefore, are appended to the Rules for Preserving and Laying out Sea-weeds, so that beginners may be at no loss how to proceed in either of these matters.

In conclusion, it is quite possible that the students who read this book may, from time to time, and here and there, find imperfections in the accounts, or think of some happier way or words in which the meaning might have been expressed—I could probably do so myself were the printing to recommence. But of one thing they may rest assured,—the work has been in the strictest sense a labour of love. It is scarcely too much to say, that in all the 384 descriptions there is not a line of mere heartless copying or scissors-work. In all cases, my endeavour has been to understand the scientific statements myself before attempting to make them comprehensible to others. The labour of love, therefore, has also been conscientiously performed; and if those who have improvements to suggest will insert them in their own copies, and make them known to their friends, further assistance will be gained towards the clearing and *really* popularising one of the most charming studies which, in the goodness of God, this wonderful earth affords to its inhabitants. Only let natural history be pursued with the “reverence” on which our great poet insists, so that we may not become conceited with our beautiful but imperfect “broken lights,” and we shall find in it a fountain of perpetual enjoyment, and a resource against thousands of the lesser and often foolish disturbances of life, which otherwise are so apt to lay too keen a hold upon the mind, especially of those who lead quiet uneventful lives. What saith the Book of Wisdom? “By the greatness and beauty of the creatures, proportionably the Maker of them is seen;” and to dwell on Him in the glory of His works here, is beginning to do in a lesser degree now what we hope to do in the full perfection of knowledge hereafter.

RULES FOR PRESERVING AND LAYING OUT SEA-WEEDS.

WHENEVER it is possible sea-weeds should be laid out on paper, and put under pressure the same day they are gathered; but as this is not always practicable, especially to lady-collectors, who have friends' convenience to consult, and other matters to attend to, it is well to point out the two other methods by which shore-gatherings may be kept tolerably safe, until the laying out can be accomplished.

I shall call one the *damping* process; the other is called *rough-drying*.

The damping process is chiefly for cases of emergency, although it can be made available for the complete drying of plants if carefully repeated. Now one of an amateur-collector's emergencies is, when in the course of travelling in an orthodox-touring hurry with non-naturalist friends, she has collected a basketful of plants on the shore, but has neither time nor opportunity for even rough-drying them—much less for laying them out; and the question arises, What is to be done with them? for they will soon decompose and become worthless if they are allowed to lie long together in a mass.

Well, let her travelling-bag always contain two or three old towels—soft thick ones are best—and at the first ten minutes' opportunity let her deal with the sea-weeds as follows:—

Spread one of the towels on a table or the floor, and scatter a few plants in a row across it, near one end, but leaving enough of towel beyond to fold over the plants. When so folded, scatter a second row on the fold itself, remembering in all cases to spread and separate the plants nicely, so that they may not lie too thick. Then double this fold over so as to cover the plants, and proceed to scatter a third row as before; then fold it over, and so on again till plants and towel are formed into a sort of roly-poly pudding; the towel answering to the paste, and the sea-weeds to the sweetmeat. It will be a dampish bundle, but, wrapped in a dry towel, it may be stowed away in a bag, or covered up in the sea-weed basket.

It is to a well-known algologist, my friend Miss Cutler, that I am indebted for these hints, and as the plan was practised by her in my behalf on the occasion of a hurried visit to the shore at Exmouth, and many of the plants were laid out successfully the following day, I have no hesitation in recommending it in cases of inevitable hurry.

Rough-drying has other advantages, and is performed as follows:—Spread three or four newspapers on the floor of an airy room, or in any airy situation, so that it is not exposed to the full blaze of the sun; for, as before explained, sunshine takes the colour out of sea-weeds. On these newspapers scatter, as lightly and thinly

as possible, your fresh-gathered plants, just as you brought them in from the shore. For you must neither squeeze them nor rinse them in fresh-water, nor do anything, in short, to get rid of the sea-water which hangs round them, and which, if you will allow it to dry naturally upon them, will both preserve them sound and keep them pliable, so that they will easily remoisten. If they are very dirty indeed, you may send for some clean *sea-water* and shake them in it, so as to get them into a state of average cleanliness before scattering them on the newspaper. But, even then, no squeezing or dabbing is allowed. Shake them once or twice if you please, if they are streaming as you lift them from the basin, but that is all.

Now, in warm weather, and in a dry place, and with plenty of air, your plants will soon begin to dry a little. And if you like to turn them over after an hour or two, there can be no objection, for there is no reason why the hay-making principle should not be useful here, and both sides of a sea-weed have the same chance. Even with turning, however, and that more than once, it is uncertain how long your plants will be before they are sufficiently dry for packing. Sometimes—but not often in England—a few hours will suffice; at others, a few days will be necessary. The artificial heat of a room may be used now and then to assist the operation, but it must be done in moderation. When tolerably dry—sufficiently so for there to be no danger of their clinging together and moulding, you may drop them into paper bags, ready to be packed up when next you start. And the word *drop* is used, to make it thoroughly understood that they must be allowed plenty of air-room, and on no account be pressed down to get them into a small compass. And the same loose packing must be practised with the bags themselves. The plants will not bear squeezing.

This rough-drying process is perfect for all the coarser plants, and answers very fairly with so many of the others, that you cannot do better than practise it wherever you go. For, even when able to lay out some plants at the time you collect them, it is always pleasant to have a few more after you come home, whether for yourself or for giving away, and such paper bags of sea-weeds travel nicely in a hamper, and are very light.

And the plan is invaluable for another reason. It is so easily carried out, that you may even venture to ask non-naturalist friends to practise it in your behalf, if either living or travelling in other countries. And in this way your collection may be enriched by some of the curious and beautiful growths which exist in distant seas. For algæ preserved in this manner remain in good condition for a length of time, and all but the *very* delicate ones will bear wetting and being laid out at leisure, quite well.

There remains now to be considered the process of *laying out*, which, be it remembered, when well done at first, is the one *sure* way of preserving algæ in perfection.

It is a rather complicated operation, but soon learnt, and easily practised, when once understood. Some little contrivance is necessary, however, to avoid annoying other people and injuring furniture; and a luxurious algologist would like to have a room to himself, with a carpet that would not stain, and a deal table which no amount of splashing would spoil. But it is wonderful what may be done without luxuries! I have known it possible, even when visiting, to lay out plants in a bed-room, washing them in a basin, spreading them in any shallow bath that

happened to be there, and pressing them under a travelling box, neither wetting the furniture nor doing anything else to annoy the hostess, and causing no extra trouble but the emptying of the bath once oftener than usual.

This is rough work, though, and seldom necessary. In any house you may, by asking, have the use of a common table, or cover a better one with oil-cloth, and so also the floor. You must then have ready a largish bowl and three moderate-sized meat-dishes—if white, so much the better. Also some fine white “medium” cartridge or drawing-paper, previously cut into three sizes, so that there may be uniformity in the appearance of your collection. Also an ample supply of blotting-paper (the cheap sort is sufficiently good), and of well-washed muslin (the commonest kind of book-muslin) cut into slips of folio-paper size. You require also a camel’s-hair brush for cleaning the plants, and a porcupine’s quill or ivory knitting-needle, or something pointed, for separating fine branches and spreading them delicately on the paper. A pair of scissors, too, for clipping overthick specimens; a pair of pincers for lifting them about; and, finally, *plenty* of both sea and fresh water. Of course, too, there should be a puncheon at hand, to receive the water in which you have been laying out your plants, the moment you observe it becoming dirtied or discoloured; for, without the strictest attention to its cleanliness and purity, the paper on which your specimen is spread will be stained, and remain an eyesore for ever.

And now, with all these appliances around you, begin your work by *washing* your plants. For which purpose put a dozen or so into the *bowl*—those first which you may have brought home in bottles—and pour sea-water on them. Do not overcrowd the bowl, or you cannot see what you are about. With a moderate number you can take them up one by one and shake them a little in succession. Then place one in a dish with sea-water, and, drawing it to you, observe its condition as to dirt and mussels, which often infest sea-weeds. Brush it over carefully with your camel’s-hair brush to remove the dirt, and if the mussels will not move, *press* them off with the end of the porcupine’s quill. When you are satisfied that the specimen is clean, remove it into dish No. 2, still floating it in sea-water, and there let it remain till you have prepared several others in a similar manner; for it does not do to go backwards and forwards from one part of the process to another.

When you have got from half-a-dozen to a dozen plants (dependent on their size, for they must never be crowded) in dish No. 2, push the first dish away and bring the second close. The plants are all clean, it is true, but you have now to consider, as you see them floating in the water, whether they will look well when flattened by pressure, or whether any bushy ones among them may not be improved by a little thinning. If there are branches springing from all sides of the stem (*quadrifariously*), as in the cases of *Callithamnion arbuscula* (Fig. 262), and *Chrysiomenia* (now *Chylocladia*) *clavellosa* (Fig. 136), your *laid-out* frond will form heavy lumps here and there, and its beauty will be lost. Unpleasant, therefore, as it is to clip any luxuriant growth, it is desirable to make the sacrifice, and to cut away some portion of the branches, that the rest of them may be seen to advantage.

But there is still a difficulty before you. There are some plants which will not bear even the touch of fresh water, and which, therefore, must be laid out, as well as cleaned and prepared, in that from the sea.

Polysiphonia Brodiaei (Fig. 120), for instance, begins to decompose at once in

fresh water, and were you to attempt to lay it out therein, you would see all the fine tips of the branches breaking off under your brush, till it became comparatively quite stunted. So also *P. fibrata* (Fig. 113), *P. violacea* (Fig. 119), and *P. fibrillosa* (Fig. 123). But this last is almost worse, for it decomposes so rapidly under any circumstances, that only laying it out at once saves it from destruction. The *Griffithsias* (Plates LIII., LIV., LV.) are nearly as bad. What they do is to crack and let out all their fine pink colouring-matter, so that, although they do not rot in pieces like the more fragile *Polysiphonias*, they leave you nothing but their faded forms to remind you of your mistake. And much the same may be said of *Calithamnion Borreri* (Fig. 272), *Wrangelia multifida* (Fig. 249), *Gloiosiphonia capillaris* (Fig. 219), which also decomposes; and *Nemalion multifidum* (Fig. 217), &c. Nay, even the common *Ceramium rubrum* (Fig. 242), if long soaked, will serve you the same trick, while *Nitophyllum versicolor* (Fig. 181) changes from rose-colour to orange. And there are other species similarly effected, all of which should, by rights, be laid out in their native element, and attended to as soon as possible.

The necessity of washing the general collection in sea-water is therefore obvious. The almost certain result of plunging a dozen plants at random into the other is, that before ten minutes are over *some* of them would perish, discolouring the whole mass of water and injuring any delicate companions.

It must be borne in mind, that as the above list does not comprehend *all* the fragile plants, the collector will do well to make experiments upon those with which he is not acquainted; and if he loses a few plants by a few mistakes at first, do not let him grudge them. The lesson of knowing better next time is a good thing in exchange.

On the other hand, there are certain plants which *improve* by being steeped for some time in water from the well. Of this sort are *Dasya coccinea* (Fig. 135), *Plocamium coccineum* (Fig. 178), and *Laurencia obtusa* (Fig. 132,) provided that they are still the brownish-red tint of complete freshness when you begin upon them. If from exposure on the shore, or in your basket, they have already turned the beautiful cochineal colour you wish them to be, the object of soaking them is effected. The next process will be decomposition and fading, so lay them out while they are pretty, in whichever water you have at hand.

And the operation is the same in both cases. Put dish No. 2 on one side, and place dish No. 3 before you. Pour into it whichever water your plant requires, and lift your plant in from dish No. 2. Then take a piece of the ready-cut paper, of the size that will allow you a handsome margin round it, and slip it into the water underneath the plant, keeping just hold of it on one corner with your left hand. Then with the porcupine's quill or camel's-hair brush in your right hand, help the plant to arrange itself gracefully on the paper, and when you are satisfied with its position, begin drawing it carefully and gently out, taking care that it is properly displayed, and brushing away any atoms of dirt that may appear on the water. It will be, of course, during this operation in a more or less sloping position, for the shallowest dishes have sides; and you will have to take care, especially if it be a gelatinous plant, that it does not slip away suddenly, and rush back into the dish. But a little practice soon enables the disciple to manage this part of the business. Like bringing a trout to land, it has its difficulties; but if you love your plant as

Izaak Walton would have Piscator do his fish, you will bring him to at last. Here, however, I must mention a rather new device for rendering this part of the laying-out process much easier. It is the use of a very thin plate of zinc, perforated with small holes; which, being placed in your dish—one end supported by the ledge, the other plunged in the water—forms an inclined plane, over which it is comparatively very easy to draw out the paper with the plant upon it. The material may be bought at a trifle per yard at any wire or metal shop, and you can have it cut to what size you please. Of course it must be the length of the dish in use; and an oblong shape; with one rounded end, is desirable. The advantage gained is that the paper can no longer bend, which it is otherwise apt to do in a treacherous manner, as you draw it over the edge of the plate, the metal plate keeping it flat throughout, while the holes allow the water to drain away.

What has been so long and successfully done without, can, of course, be done without now, but both time and trouble are saved by this simple invention, and it is within the reach of every one who will take the trouble to procure it.

On the removal of the paper with the plant upon it from the water, it may be either laid at once upon sheets of blotting-paper (four thick), or you may place it for a short time on a linen cloth or sheet, spread over another table, or the back of a sofa, or even on the ground. This is merely to absorb a little portion of the water, and I believe the plan to be a good one, inasmuch as it prevents the mass of blotting-paper from the excessive saturation it otherwise must undergo.

And now leave it, and proceed in the same way with more plants till you have enough to cover the whole sheet of blotting-paper; and when they are all neatly laid side by side, but not touching, upon it, cover them with one of the pieces of muslin already spoken about. On the top of which muslin place four more sheets of blotting-paper, and then you have a fresh dry surface on which to lay another batch of plants similarly prepared and treated. And proceed in this way till you have raised a bundle—it may be even six or eight inches thick—of alternate blotting-papers, plants, and muslin. Which bundle place between two flat boards, weighting the top moderately; or if in a clothes-press, be careful not to screw it *tightly* down. This is an error into which beginners are very apt to fall; but it may be here laid down as a rule, that except in dealing with the stiff, unruly, *leathery* olive algæ, strong pressure is never necessary, and often most objectionable. If it does nothing else, it stamps the texture of the muslin both on paper and plant, disfiguring the one and destroying the character of the other. Neither does it ensure the *flatness* of the paper to squeeze it in this violent manner. Permanent evenness and flatness are produced by *continued* moderate pressure—*continued*, even after the drying seems effected.

At the end of five or six hours take the bundle from between the boards, remove the top sheets of blotting-paper, lift the muslin most carefully off the sea-weeds, and then proceed to place them on other dry sheets of blotting-paper as before. And in most cases it is well to repeat the muslin cover also. Do the same, of course, to all the layers in succession, and put the new bundle between the boards again; this time with a rather heavier weight, and there leave it for half a day; after which, change the blotting-papers once more, but the muslin will no longer be required. Weight them again between the boards, and leave them for one, two, or

three days, as is most convenient, by which time they will appear perfectly dry. Nevertheless, it is no bad plan to change them once again, putting them now in single sheets of blotting-paper. Then replace them between the boards, and then—*forget them*, if possible; for the longer they remain in press the firmer they will be, and the less liable to curl.

Thus much for the process generally; but one or two remarks must still be made. Very coarse and very delicate plants must not be mixed in the same bundle. The former need strong pressure to get them tolerably flat. *Fucus* (now *Fucodium nodosum*) *nodosus* (Fig. 13), for instance, with its large thick air-vessels, would ruin several layers of delicate plants, as its impression could not fail to be forced through the damp blotting-paper. The same remark applies to the *roots* of plants, which are fatal to their neighbours when pressed in. It is always desirable to possess the root, but let it be trimmed and subdued as much as possible, and where inveterately troublesome, kept at the outer edge of the sheet. Coarse and fine plants must be arranged in separate bundles, therefore, and placed in a different press, or with a dividing board between, and roots must be made as little offensive as possible.

Again: as to the recommendation of blotting—rather than botanical drying—paper as a soaking medium; this is made on account of the much smoother surface it possesses. The inequalities of botanical drying-paper always become more or less impressed upon the damp sea-weed papers on which they lie, and as this is inevitable even under moderate pressure, and is decidedly disfiguring, blotting-paper is much to be preferred.

Then, in speaking of the laying-out paper, let me protest warmly against the use of anything blue-tinted, however good otherwise it may be. A rose-coloured sea-weed on blue writing-paper loses half its beauty, as the general effect produced to the eye is a muddled lilac hue. Indeed, on the perfect whiteness of the paper employed, half the perfection of the specimen depends, for it can only be seen properly on such. The fine-grained white “medium” cartridge-paper spoken of is sufficiently good. But better still, and very reasonable in price, is to be had at Saltecoats, in Ayrshire,* if the sending to a distance be no objection. At any rate, the paper used must be smooth and milk-white, if the specimens are to be displayed to their best advantage.

In all cases pieces of each plant should be dried on small plates of mica, about three inches by one; and these preserved in the collection with the specimens on paper, that they may be ready for examination under the microscope. A drop of water will revive them at any time, and when dry again they may be replaced. This rule of course applies to the finer plants only.

Now for a few words upon special plants. The “tough, leathery,” olive ones, *Sargassum*, *Cystoseira*, *Fucus*, &c., should be soaked for an hour or two in hot water before being laid out and pressed, as they are thereby rendered more pliable. They may be fastened to their papers at last with gum, as they do not adhere naturally. Most of the finer plants adhere naturally, but the coarser ones, which do not, may be fastened down by glue; the finer by gum tragacanth paste; or by washing both specimen and paper over with *skimmed* milk, applied by a varnish brush.

* Of Mr. Arthur Guthrie, Bookseller, Saltecoats, Ardrossan, Ayrshire. It was kept by him cut in three useful sizes, under the direction of the late Dr. Landsborough, and is still kept for sale.

Delesseria (now *Wormskioldia*) *sanguinea* (Fig. 169), preserves its colour better when the wet blotting-papers are changed very quickly.

Mesogloia vermicularis (Fig. 55), and *virescens* (Fig. 57), *Gloisiphonia capillaris* (Fig. 219), *Porphyra laciniata*, and any very gelatinous plants, should never have their muslin removed under any of the changes of the blotting-papers: not, in short, till they are completely dry.

Several of the thin flat expansions, as the *Rhodymenias*, *Nitophyllums*, *Iridea*, *Rhodophyllis*, *Callophyllis*, *Kallymenias*, *Halymenia*, *Ulva*, &c., contract so much in drying, that ample allowance should be made for it, by laying them very easily on the paper—never stretching them to anything like their full *wet* length. Otherwise, when dried, they will crack in all directions. Rough-dried specimens require the same treatment as fresh ones, except that they will need soaking to induce them to expand. The coarse olive plants should never be left soaking with finer ones, as they give out a slimy juice.

Codium bursa (Fig. 284) is a specialty, and must be specially treated. It is a thick lump, and must be pressed alone and very gradually, or the frond will crack and burst; the pressure being increased day by day as the lump subsides. It may be made quite flat at last, but time and patience are necessary. If two or three growing in a close group are pressed together, put little bits of muslin between them, and do not remove these till the process of pressing is completed. Some people prefer preserving it in a bottle with spirits of wine and water (one part spirit, two water). This plan has the advantage of not destroying its shape, but the bottle is inconvenient in the herbarium.

Leathesia tuberiformis (Fig. 54), and the *Rivularias* (Plate LXXV.), require gradual pressing also.

Certain *incrusting* plants, as *Ralfsia verrucosa* (Fig. 60), *Cruoria pellita* (Fig. 227), (now *Petrocelis cruenta*), *Hildenbrandia rubra* (Fig. 161), &c., cannot be *displayed* on paper. Morsels of them may be kept in little paper cases fastened in the herbarium, but dissected portions of each should be mounted in microscopic slides for observation of the structure.

The lumpy *Melobesias* (Figs. 156—159) can only be kept in boxes.

HOW TO MAKE SECTIONS OF ALGÆ FOR MICROSCOPIC EXAMINATION.

For making sections or *durchschnitte* it is necessary to have a small working microscope, a few glass slides and thin cell-covers, and a delicately fine knife.

An excellent microscope of the proper sort is to be had for a few shillings; and if the knife it contains be not sufficiently fine, an infant's gum lancet, well sharpened, answers the purpose.

The little instrument has, of course, a stem on which the eye-glass runs up and down; and this being fastened to the wood-work of the box, can be shut in or turned out at will. When turned out, the box itself forms a small stage or platform to work upon; the student looking down upon it through the glass. Note here, that it is well to gum a piece of white paper on the stage to begin with, as the operations to be performed are thus more easily seen. On this stage place a glass slide, and on the slide place a morsel of the plant to be examined, say a quarter of an inch or so of a stem or branch. Hold this scrap firmly down to the slide by the first finger of your left hand, pressing the nail against its extreme end, so that as you look through the eye-glass you can only see the *merest edge* of the plant. Then, with the knife or lancet in your right hand, slice off this *mere edge* (the thinner the slice the better), and drawing the left nail very slightly back, leave another *mere edge*, which cut off in a similar way; and so another, and another, and another, till you have six or eight slices on your slide.

Now wet the tip of a finger in clean water, and let down one *small* drop thereof upon the centre of the slide; into which minute pool coax your little *durchschnitte*, by the aid of the small *pointer* contained in your microscope box, and then—replacing the slide on the stage—give yourself the pleasure of watching the magnified slices expand in the liquid.

With fresh-gathered plants there is no difficulty, of course, but sections of dried specimens are occasionally troublesome, by refusing to resume their natural shape. A drop of muriatic acid will sometimes induce them to open, but not always. Nevertheless, it is so rarely possible to mend the matter by moistening the dried specimen *before* it is cut, and clean, good sections are so much more easily made of dried plants than of re-moistened ones, that the *rule* is, to cut them in their dried state, as a first effort, and resort to other expedients, if necessary, afterwards.

But to proceed. The sections being more less expanded, take one of the thin cell-covers (ascertaining that it is clean and bright), and let it gently down upon the slide over the little pool and its contents, and you have at once a *microscopic slide* ready for examination under your compound microscope.

Troublesome as this operation may seem to be, when read of, it is a very amusing one in practice, and by no means hard of accomplishment. *Longitudinal* sections are made in the same way; but it is always well then to secure a *fork* in the

branching, as the one stem can be held down quite firmly while the other is being cut; whereas one only, if very slender, cannot be thoroughly secured during the process of cutting.

Were the mechanical part now described the worst difficulty in the examination of sea-weed structure, all the world might be made learned by algological *durchschnitts*; but the delicacy of eye and judgment requisite for understanding the meaning of what is seen, is a part of the matter not so easily taught or acquired. Courage, however! A comparison of fresh-gathered and dried *durchschnitts* of the same *genera*; a habit, if possible, of making drawings of everything one sees; and a patient acquiescence with the necessity of being twenty times mistaken at first for every once one is right, will go a long way towards making a *scholar* in its secondary sense, out of a mere scholar or amateur.

THE AMATEUR'S SYNOPSIS.

OLIVE SEA-WEEDS. (*Melanosperms.*)

FLAT.

— with a Midrib.

Leathery; slimy.

Narrow; branched in a forked manner; air-vessels, inflations in the frond

<i>Genus.</i>	<i>Fam.</i>
FUCUS	I

Membranaceous.

Narrow; forked; marked by dots (when in fruit) . .
Long; narrow (in proportion); leaf-like; stalked . .

HALISERIS	IV
ALARIA	III

— without a midrib.

Leathery; slimy.

Broad expansions; spreading from thick stalks; variously slit

LAMINARIA	III
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Membranaceous.

Long; narrow (in proportion); ribbon-like; stalked .
" " " tubular, though com-
pressed; surface speckled with dots . . .
Leaf-like, tapering to the base; " " . . .
Fan-shaped, or circular; margins *curled*; marked by
concentric lines
Fan-shaped, or circular; margins *flat*; marked by con-
centric lines, but the lines obscure
Spreading fan-wise; irregularly slit; tips bluntly cut;
marked by both lines and dots
Much and irregularly slit; tips torn, pointed; speckled
with dots
Narrow; forked throughout; root woolly
Leaf-like stem and branches, tapering to each end;
branches opposite
Very narrow; irregularly forked; young shoots springing
from blunt tips
Extremely narrow stems and branches (thread-like);
thorny; or fringed with bright green tufts . . .

LAMINARIA	III
ASPEROCOCCUS	IV
PUNCTARIA	IV
PADINA	IV
ZONARIA	IV
TAONIA	IV
CUTLERIA	IV
DICTYOTA	IV
DESMARESTIA	II
CARPOMITRA	II
DESMARESTIA	II

CYLINDRICAL (*thread-shaped*).

— unjointed.

Tough; leathery.

Thick, long, slimy, unbranched; tapering to each end .
Shrub-like stems and branches; bearing narrow mid-ribbed
leaves and berry-like air-vessels
" " " flattened; narrow; at one
level throughout; air-vessels pod-like
" " " flattened; growing all ways;
very bushy; air-vessels oval inflations
Thick, sometimes flattened stems; forked; air-vessels large
oval inflations

CHORDA	V
SARGASSUM	I
HALIDRYS	I
CYTOSEIRA	I
FUCODIUM	I

Membranaceous or Gelatinous.

	<i>Genus.</i>	<i>Fam.</i>
Long, loose-feeling, slimy; branching irregular; very thick and clumsy, or very slender	MESOGLOIA	V
Bag-like, of every width from a hog's bristle to six inches; speckled with dots; tips blunt	ASPEROCOCCUS	IV
Stem undivided; branches simple; bearing green-crested seed-pods	SPOROCHNUS	II
Stem undivided, or slightly forked; branches long; simple; clothed with fine colourless fibres	CHORDARIA	V
Stem and branches tapering to each end; opposite; marked by rings (<i>whorls</i>) of dots	STRIARIA	IV
Irregularly divided or branched; speckled with fruit-warts	STILOPHORA	IV
Stems profusely and repeatedly rebranched; branches alternate	DICTYOSIPHON	IV
Stems profusely and repeatedly rebranched; branches opposite	DESMARESTIA	II
Very short tufts; threads unbranched; clothed with colourless fibres	WYATTIA	IV

— **clothed with Jointed Branchleteens.**

Soft; branches distant; mostly opposite; branchleteens bright green, hair-like; set in rings (<i>whorls</i>)	ARTHROCLADIA	II
Rigid; dull olive or brown; branchleteens short, curved; in rings (<i>whorls</i>)	CLADOSTEPHUS	VI

— **contracted at intervals.**

Stems unbranched; contractions inflated; of irregular lengths	CHORDA	V
Large, bag-like; contractions inflated; of irregular lengths; speckled with dots	ASPEROCOCCUS	IV

— **jointed.**

Branches delicately plumed like feathers; main stems opaque	CHÆTOPTERIS	VI
Branches delicately plumed like feathers; jointed throughout	SPHACELARIA	VI
Undivided stems clothed with branchlets tipped by colourless fibres	MYRIOTRICHIA	VI
Slender, thread-like tufts; profusely and variously branched	ECTO CARPUS	VI
„ very short tufts; threads unbranched; parasitic	ELACHISTA	V

INCRUSTATIONS or PATCHES.— **dark brown.**

Leathery, skin-like, closely adhering, often rough with fruit-warts	RALESIA	V
Fleshy, convex, smooth	LEATHESIA	V
Minute, parasitic, forming thin stains or convex dots	MYRIONEMA	V

IRREGULAR or DEFINED LUMPS.

Fleshy, irregularly round, in potatoe-like clusters, or rarely minute; parasitic	LEATHESIA	V
Tough, leathery, fungus-like, sending up long, strap-like, slimy, fruit-receptacles	HIMANTHALIA	I

RED SEA-WEEDS. (*Rhodosperms.*)*FLAT.*

—— with a Midrib.

Membranaceous.

	<i>Genus.</i>	<i>Fam.</i>
Thin, leaflike; midribs throwing out leaflets . . .	DELESSERIA	XI
" " " blood-red; fruiting in winter .	WORMSKIOLDIA	XVI

—— without a Midrib.

Membranaceous; thin.

Small; oval; leaf-like; with oval leaflets springing from the margins	CHYLOCLADIA	XVIII
Fan-shaped (rarely narrow); veins rising from the base	NITOPHYLLUM	XI
" no veins; turning orange in fresh water .	NITOPHYLLUM	XI
Wedge-shaped; of various widths; purplish . . .	RHODYMENIA	XVI
Oblong; of various widths; margins often fringed with frondlets	HALYMENIA	XVIII
Narrowish; repeatedly forked throughout; margins sometimes fringed	RHODOPHYLLIS	XVI
" more or less forked; tips obtuse; fruit-like midrib-lines	STENOGRAMME	XVI
Narrow; purplish; cut out into branches; margins notched	ODONTHALIA	VII
" distantly forked; divisions wedge-shaped .	GRACILARIA	XI
Very narrow; rose-red; last branchlets set on one side only, like the teeth of a comb	PLOCAMIUM	XVI
Very narrow; repeatedly forked and branched upwards	EUTHORA	XVI
" stems and branches tapering to each end	GRATELOUPIA	XVIII
Extremely narrow; branches repeatedly plumed and replumed with short branchlets and branchleteens; the latter jointed	PTILOTA	XIX

Membranaceous; thick.

Oval; rising from a short stalk	SCHIZYMENIA	XVIII
Soft; roundish; margins throwing out fronds . . .	KALLYMENIA	XVIII
Crisp; slit into broad, wedge-shaped divisions . . .	CALLOPHYLLIS	XVIII
" of various widths; margins fringed with frondlets	CALLIBLEPHARIS	XI

Rather rigid.

Stalked; wrinkled; margins throwing out young fronds	PHYLLOPHORA	XVIII
" " several times forked; expanding fan-wise	RHODYMENIA	XVI
" roundish; horizontally laid; rooted by fibres from its under surface	PEYSSONELIA	XIV
Stalked; branches regularly and repeatedly plumed and re-plumed with short branchlets and branchleteens	PTILOTA	XIX

Gristly.

	<i>Genus.</i>	<i>Fam.</i>
Stalked; spreading fan-wise above; many times forked	CHONDREUS	XVIII
„ „ narrow; repeatedly forked; tips blunt; dark red	GYMNOGONGRUS	XVIII
„ „ channelled; spreading upwards into wedge-shaped divisions; purple	GIGARTINA	XVIII
Narrow stems and branches tapering to both ends, tips of branchlets blunt	GELIDIUM	XII
Shrubby; much branched; upper branches set with short, sharp, horizontally set branchlets	SPHEROCOCCUS	XI

CYLINDRICAL (thread-shaped), BRANCHED.

— unjointed.

Gristly.

Dark; solid; repeatedly and regularly forked; root a disc	POLYIDES	XIII
„ „ „ last forkings long; root fibrous	FURCELLARIA	XVIII
Irregularly forked, beset with clusters of small, oval, membranaceous leaflets	LOMENTARIA	VIII
Purplish; wiry; closely forked; entangled	GYMNOGONGRUS	XVIII
„ „ distantly and irregularly branched; entangled	AHNFELDTIA	XVIII
Branches strongly curved, and pointed; branchlets few	GIGARTINA	XVIII
Simple; or sparingly forked; branches simple; short	CORDYLECLADIA	XVI
Irregularly, often slightly, branched; branches tapering to each end	GRACILARIA	XI
Very bushy; often but irregularly rebranched; tips pointed	CYSTOCLONIUM	XVIII
The thickness of hogs' bristles throughout; forked or three forked; tips swollen	GELIDIUM	XII

Membranaceous and Gelatinous.

Pale pink; repeatedly forked; tips blunt; occasionally midribbed	SCINAIA	XV
Dull purple; solid within; irregularly forked; clumsy	NEMALEON	XV
„ tubular; stems undivided; branches long, simple, tapering to each end	DUMONTIA	XVIII
Purple red; solid within; stems undivided; branches long, simple, tapering to each end	HELMINTHOCLADIA	XV
Fleshy; sometimes compressed; branched and rebranched with short blunt branchlets	LAURENCIA	VIII
Slender; generally, undivided stems, set with long branches, clothed with very short branchlets	CHONDRIA	VII

More or less soft and threadlike.

	<i>Genus.</i>	<i>Fam.</i>
Bushy; nearly opaque; marked by lines across . . .	RYTIPHLEA	VII
" " not marked by lines across . . .	RHODOMELA	VII
Dull purple; entangled; tips strongly curled inwards	BOSTREYCHIA	VII
Rose-red; set throughout with exactly opposite branchlets	BONNEMAISONIA	VIII
Rose-red; irregularly forked; tips forked and hooked in	MICROCLADIA	XIX
" gelatinous; tubular; stems thick in the middle, gradually tapering to both ends; repeatedly re-branched	CHYLOCLADIA	XVIII
" gelatinous; loose-feeling; bushy; branchlets crowded; generally opposite; very slender . . .	GLOISIPHONIA	XVIII
" gelatinous; loose-feeling; branches and branchlets alternate; having a beaded appearance; tips pointed	DUDRESNAIA	XIX
" gelatinous; loose-feeling; branches chiefly opposite; branchlets with blunt tips . . .	HELMINTHORA	XV
" gelatinous; branches spreading all ways; branchlets slender; often swollen in the middle; sometimes beaded	NACCARIA	IX

— clothed with Jointed Branchleteens.

Stems robust, often hairy; branchleteens tufted; alternate	DASYA	VII
" thickened by rings (<i>whorls</i>) of overlapping branchleteens	HALURUS	XIX
" marked by lines across; branchleteens hairlike; fringing	SPYRIDIA	XVII
" undivided; repeatedly branched; branchleteens opposite, or in rings (<i>whorls</i>) . . .	WRANGELIA	IX
Gelatinous; parasitic; branchleteens very short; in close rings (<i>whorls</i>)	CROUANIA	XIX

— contracted at Intervals.

Gelatinous.

Contractions surrounded (<i>whorled</i>) by branches and branchlets	LOMENTARIA	VIII
Irregularly branched; contractions short and uniform throughout	CHAMPIA	VIII
Dull purple; short; matted; contractions of different sizes	CATANELLA	XVIII
Thick; repeatedly forked; contracted at the angles of divisions	SCINAIA	XV
Contractions strongly marked; bead-like; forming oval leaflets; fresh sets springing from each contraction	CHYLOCLADIA	XVIII

— jointed.

Soft, and thread-like.

	<i>Genus.</i>	<i>Fam.</i>
Joints marked by several upright lines (internal colour-tubes)	POLYSIPHONIA	VII
Joints marked by one upright rose-coloured line (internal colour-tube); branching forked . . .	GRIFFITHSIA	XIX
„ excessively slender; branchlets short, profuse, spreading	CALLITHAMNION	XIX
„ „ seeds (<i>spores</i>) in bead-like strings	SEIROSPORA	XIX
„ „ the thickness of horse-hair; stems distantly set with tufted branchlets . . .	CORYNOSPORA	XIX
Joints wholly coloured; or partly coloured, partly transparent	CERAMIUM	XIX
Solid; opaque; coated with a limy deposit; stems branched and rebranched on each side . . .	CORALLINA	X
„ „ coated with a limy deposit; branching forked throughout	JANIA	X

INCRUSTATIONS or PATCHES on Rocks and Algæ.

Glossy, dark red, adhering closely; when in fruit, pitted with small holes	HILDENBRANTIA	XIV
„ „ „ not pitted	CRUORIA	XIV
„ „ „ „	PETROCELIS	XIV
Minute; globose; drop-like; dark red	ACTINOCCLUS	XIV
Lilac pink, fading to white; like white or tinted patches of lime	MELOBESIA	X
„ „ minute, dot-like (microscopic)	HAPALIDIUM	X

IRREGULAR LUMPS.

Solid; stony; coral-like, branched or unbranched . . .	MELOBESIA	X
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GREEN SEA-WEEDS. (*Chlorosperms*).

FLAT; MEMBRANACEOUS.

— ribless.

Purple.

	<i>Genus.</i>	<i>Fam.</i>
Round or ribbon-like; broad or narrow expansions	PORPHYRA	XXI

Grass green.

the membrane formed of <i>two</i>		
"layers of cells	PHYCOSERIS	XXI
Puckered and bag-like when young, afterwards		
bursting; membrane formed of <i>one</i> layer of cells	ULVA	XXI
Narrow stems and branches; blunt at top; tapering		
greatly to the base	ENTEROMORPHA	XXI

CYLINDRICAL (*thread-shaped*).

— unjointed.

Solid.

Dark green; spongy; the thickness of a goose-quill;		
many times forked	CODIUM	XX

Tubular; unbranched.

Bag-like; inflated; of every width from a hog's bristle		
to three inches	ENTEROMORPHA	XXI

Tubular; thread-like; branched.

Threads in free tufts; or matted below; <i>zoospores</i>		
external	VAUCHERIA	XX
Threads long; undivided stems; profusely branched;		
tips pointed throughout	ENTEROMORPHA	XXI
Stems beautifully plumed like feathers; sometimes		
replumed	BRYOPSIS	XX
Rose-red; minute; parasitic; fringing; branching		
forked	BANGIA	XXI
Green; minute; parasitic; fringing; branching forked		
into branching bundles	HORMOSPORA	XXV
" cushion-like tufts, formed of threads collected		
into branching bundles	SCHIZOTHRIX	XXIII

Tubular; filled with colour-cells; unbranched.

Long, dark purple tufts; lying in glutinous layers on		
rocks	BANGIA	XXI
Rose-red; minute; parasitic; fringing	BANGIA	XXI
Green; " " in tufts, or forming		
close velvet-layers on rocks	CALOTHRIX	XXIII
Green; bright or dull; forming fleecy layers on floating		
plants	SPERMOSIRA	XXIV
Green; bright or dull; threads simple; needle-like;		
massed into gelatinous layers	OSCILLATORIA	XIII
Green; bright or dull; threads simple; in bundles		
enclosed in snake-like sheaths	MICROCOLEUS	XXIII
Dull-green; threads in free tufts, or layers; matted		
below	LYNGBYA	XXIII

— contracted at intervals.

Compressed; distantly branched; tips blunt; contractions long	Genus. Fam.
	ENTEROMORPHA XXI

— jointed.

Slender; tufted; much and variously branched and rebranched	CLADOPHORA XXII
„ pale green; in fleeces on rocks; not branched, but throwing out occasional fibres	RHIZOCLONIUM XXII
Slender, bright green tufts; gelatinous; unbranched	HORMOTRICHUM XXII
„ of various shades of green; in tufts; never gelatinous; unbranched	CONFERVA XXII
Rose-red; minute; parasitic; fringing; joints containing colour-cells	GONIOTRICHUM XXI
Pale-green; minute; parasitic on grasses, &c.; forming a convex hairy dot	OCHLOCHÆTE XXII

FILMS, or PATCHES.

Small, roundish, gelatinous, floating; composed of branched threads	MONORMIA XXIV
Vivid or deep green, spreading over decaying plants on mud, or floating	SPHEROZYGA XXIV
Verdigris green, spreading over decaying plants or on sticks	SPIRULINA XXIII
A dark glazy crust upon rocks; formed of closely-packed radiating threads	SCHIZOSIPHON XXIII
Dark green; velvety; spreading irregularly upon rocks; sometimes throwing up minute, cylindrical frondlets	CODIUM XX

IRREGULAR or DEFINED LUMPS.

Dark green; spongy; hollow; more or less globular	CODIUM XX
Globular; or convex; spreading like little balls on rocks and plants	RIVULARIA XXIII

LIST OF FAMILIES, GENERA, AND SPECIES, IN THE
THREE COLOUR GROUPS, FOR ARRANGEMENT
IN THE HERBARIUM.

MELANOSPERMS—(*Olive Group*).

Colour. Varying from olive-green to dark brown.

Fruit. Single seeds properly called *spores*; sunk, or partially or wholly immersed in the frond; or external.

Family 1.—FUCACEÆ.—*Tough; leathery; turning black when dry.*
Spores sunk in the frond in special, swollen, slimy portions (receptacles).

SARGASSUM; vulgare, bacciferum.

HALIDRYS; siliquosa.

CYTOSEIRA; ericoides, granulata, barbata, fœniculacea, fibrosa.

FUCUS; vesiculosus, ceranoides, serratus.

FUCODIUM;* nodosum, canaliculatum, Mackaii, tuberculatum.

HIMANTHALIA; lorea.

* Formerly *Fucus nodosus* (Fig. 13), *F. canaliculatus* (Fig. 15), *F. Mackaii* (Fig. 14), and *Pycnophycus tuberculatus* (Fig. 9).

Family 2.—SPOROCHNACEÆ.—*Soft; membranaceous; slender; turning a verdigris green in the air.*
Spores on external hair-like jointed threads.

CARPOMITRA; Cabreræ.

SPOROCHNUS; pedunculatus.

DESMARESTIA; ligulata, aculeata, viridis.

ARTHROCLADIA; villosa.

Family 3.—LAMINARIACEÆ.—*Leathery, or membranaceous; flat, leaf-like, stalked.*
Spores forming cloudy patches on the surface.

ALARIA; esculenta.

LAMINARIA; digitata, digitata var. stenophylla, bulbosa, longicruris, saccharina, Phyllitis, fascia.

Family 4.—DICTYOTACEÆ.—*Soft; membranaceous; flat, or thread-shaped, Spores forming spots or lines on the surface.*

HALISERIS; polypodioides.
 PADINA; Pavonia.
 ZONARIA; collaris, parvula.
 CUTLERIA; multifida.
 TAONIA; atomaria.
 DICTYOTA; dichotoma.
 STILOPHORA; rhizodes, Lyngbyæi.
 DICTYOSIPHON; fœniculaceus.
 STRIARIA; attenuata.
 WYATTIA;* pusilla, Laminariæ.
 ASPEROCOCCUS; compressus, Turneri, echinatus.
 PUNCTARIA; latifolia, plantaginea, tenuissima.

* Formerly *Litosiphon pusillus* (Fig. 52), and *L. Laminariæ* (Fig. 53).

Family 5.—CHORDARIACEÆ.—*Gelatinous; of various habits. Thread-shaped; tuber-like, or incrustations. Spores on threads concealed in the frond.*

CHORDA; filum, lomentaria.
 CHORDARIA; flagelliformis, divaricata.
 MESOGLOIA; vermicularis, Griffithsiana, virescens.
 LEATHESIA; tuberiformis, Berkeleyi, crispa.*
 RALFSIA; verrucosa.
 MYRIONEMA; strangulans, Leclancherii, punctiforme, clavatum.
 ELACHISTA; fucicola, flaccida, curta, stellulata, scutulata, pulvinata, velutina, Grevillei,* Haydeni.*

* See Appendix of New Species.

Family 6.—ECTOCARPACEÆ.—*More or less soft and slender; thread-shaped; jointed. Spores external on the branches.*

CLADOSTEPHUS; verticillatus, spongiosus.
 CHÆTOPTERIS;* plumosa.
 SPHACELARIA; flicina, Sertularia, scoparia, fusca, radicans, racemosa.
 ECTOCARPUS; siliculosus, amphibius, fenestratus, fasciculatus, Hincksia, tomentosus, crinitus, pusillus, distortus, Landsburgii, littoralis, longifructus, granulatus, sphærophorus, brachiatus, Mertensii.
 MYRIOTRICHIA; clavæformis, filiformis.

* Formerly *Sphacelaria plumosa* (Fig. 72).

RHODOSPERMS—(*Red Group*).

Colour. Varying from pink to crimson, or dark, reddish purple.

Fruit. Of two kinds—1. Simple seeds, properly called *Spores*.
2. Four-parted seeds, called *Tetraspores*; external; or sunk, or wholly or partially immersed in the frond.

Family 7.—RHODOMELACEÆ.—*Soft; slender; thread-like; or membranaceous; flat.*

1. Spores in external cases (capsules), having an opening at top.

2. Tetraspores immersed.

ODONTHALIA; dentata.

CHONDRIA;* dasyphylla, tenuissima.

RHODOMELA; lycopodiodes, subfusca.

RYTIPHLEÆ; pinastroides, complanata, thuyoides, fruticulosa.

POLYSIPHONIA; urceolata, formosa, pulvinata, fibrata, spinulosa, Richardsoni, Griffithsiana, elongata, violacea, Carmichaeliana, fibrillosa, Brodiaei, variegata, obscura, simulans, nigrescens, affinis, subulifera, atropurascens, furcellata, fastigiata, parasitica, byssoides.

BOSTRYCHIA; scorpioides.

DASYA; coccinea, ocellata, arbuscula, venusta, Cattlovix?†, punicea.‡

* Formerly *Laurencia dasyphylla* (Fig. 144), and *L. tenuissima* (Fig. 143).

† See Appendix of New Species.

‡ See Appendix of New Species.

Family 8.—LAURENCIACEÆ.—*Soft and thread-like; fleshy or gelatinous.*

1. Spores in external closed cases (capsules).

2. Tetraspores immersed.

BONNEMAISONIA; asparagoides.

LAURENCIA; pinnatifida, caespitosa, obtusa.

LOMENTARIA;* ovalis, kaliformis, reflexa.

CHAMPIA;† parvula.

* Formerly *Chylocladia ovalis* (Fig. 145); *C. kaliformis* (Figs. 146, 154), and *C. reflexa* (Fig. 138).

† Formerly *Chylocladia parvula* (Fig. 153).

Family 9.—WRANGELIACEÆ.—*Soft, thread-like; more or less visibly clothed with jointed branchleteens.*

1. Spores in masses, on external, hair-like, jointed threads.

2. Tetraspores external.

WRANGELIA; multifida.

NACCARIA; Wiggii, hypnoides.*

* See Appendix of New Species.

Family 10.—CORALLINACEÆ.—*Coral-like; lilac fading to white; thread-shaped; jointed; encrusting, or in lumps. One fruit. Tetraspores in external cases, having an opening at top.*

CORALLINA; officinalis, elongata, squamata.

JANIA; rubens, corniculata.

MELOBESIA; polymorpha, calcarea, fasciculata, agariciformis, lichenoides, membranacea, farinosa, verrucata, pustulata.

HAPALIDIUM; Phyllactidium.

Family 11.—SPHÆROCOCCHOIDEÆ.—*Delicately membranaceous; rarely gristly; flat and leafy; shrubby or thread-shaped.*

1. Spores in external cases, with or without an opening.

2. Tetraspores variously dispersed.

DELESSERIA; sinuosa, alata, angustissima, Hypoglossum, ruscifolia.

NITOPHYLLUM; punctatum, Hilliæ, Bonnemaïsonia, Gmelini, laceratum, versicolor.

SPHÆROCOCCHUS; coronopifolius.

CALLIBLEPHARIS;* ciliata, jubata.

GRACILARIA; multipartita, compressa, confervoides.

* Formerly *Rhodymenia ciliata* (Fig. 187), and *R. jubata* (Fig. 188).

Family 12.—GELIDACEÆ.—*Gristly or horny; flat or, rarely, thread-shaped.*

1. Spores in swollen branchlets.

2. Tetraspores also immersed.

GELIDIUM; corneum, cartilagineum.

Family 13.—SPONGIOCARPEÆ.—*Gristly; cylindrical.*

1. Spores hidden in pink wart-like excrescences.

2. Tetraspores immersed.

POLYIDES; rotundus.

Family 14.—SQUAMARIEÆ.—*Leathery or membranaceous; gelatinous. Encrusting, or horizontally laid.*

One fruit. Tetraspores in wart-like excrescences; or immersed.

PEYSSONELIA; Dubyi.

HILDENBRANTIA; rubra.

CRUORIA; pellita,* adhærens.

PETROCELIS;† cruenta.

ACTINOCOCCUS;‡ Hennesdyi.

* See Appendix of New Species. † Formerly *Cruoria pellita* (Fig. 227).

‡ See Appendix of New Species.

Family 15.—HELMINTHOCLADIEÆ.—*Gelatinous; cylindrical; branched. One fruit. Globular masses of spores immersed.*

SCINAIA;* furcellata.
NEMALEON;† multifidum.
HELMINTHORA; divaricata.
HELMINTHOCLADIA;‡ purpurea.

- * Formerly *Ginnania furcellata* (Fig. 226).
† Formerly *Dudresnaia divaricata* (Fig. 221).
‡ Formerly *Nemaleon purpureum* (Fig. 217).

Family 16.—RHODYMENIACEÆ.—*Delicately membranaceous; flat; compressed, or thread-shaped.*
1. *Masses of spores in external cases (capsules), or half-immersed.*
2. *Tetraspores variously dispersed.*

WORMSKIOLDIA;* sanguinea.
PLOCAMIIUM; coccineum.
STENOGRAMME; interrupta.
RHODOPHYLLIS;† bifida.
EUTHORA;‡ cristata.
RHODYMENIA; palmetta, palmata.
CORDYLECLADIA;§ erecta.

- * Formerly *Delesseria sanguinea* (Fig. 167).
† Formerly *Rhodymenia bifida* (Fig. 183).
‡ Formerly *Rhodymenia cristata* (Fig. 184).
§ Formerly *Gracilaria erecta* (Fig. 163).

Family 17.—SPYRIDIACEÆ.—*Soft; membranaceous; thread-like; fringed with jointed branchleteens.*
1. *Spores in external, closed cases (capsules).*
2. *Tetraspores, external.*

SPYRIDIA; filamentosa.

Family 18.—CRYPTONEMIACEÆ.—*Of every sort of substance and habit. The internal structure consisting wholly, or in part of jointed threads, compacted together by gelatine. Or some of the membranaceous species made up of many-sided cells similarly compacted.*
1. *Masses of spores in external cases (capsules), with or without an opening.*
2. *Tetraspores chiefly immersed.*

PHYLLOPHORA; rubens, membranifolia, Brodiaei, palmettoides.
GYMNOGONGRUS; Griffithsia, Norvegicus.*
AHNFELDTIA;† plicata.

- * Formerly *Chondrus norvegicus* (Fig. 203).
† Formerly *Gymnogongrus plicatus* (Fig. 211).

CYSTOCLONIUM;* purpurascens.
 CALLOPHYLLIS;† laciniata.
 KALLYMENIA; reniformis.
 GIGARTINA; pistillata, acicularis, Teedii, mamillosa.
 CHONDRUS; crispus.
 HALYMENTIA; ligulata.
 CHYLOCLADIA;‡ clavellosa, rosea, articulata.
 DUMONTIA; filiformis.
 CATENELLA; opuntia.
 FURCELLARIA; fastigiata.
 GRATELOUPIA; filicina.
 SCHIZYMENTIA;§ Dubyi, edulis.
 GLOIOSIPHONIA; capillaris.

* Long known as *Hypnea purpurascens*.

† Formerly *Rhodymenia laciniata* (Fig. 179).

‡ Formerly *Chrysomenia clavellosa* (Fig. 136), and *C. rosea* (Figs. 141, 142).

§ Formerly *Kallymenia Dubyi* (Fig. 213), and *Iridaea edulis* (Fig. 214).

Family 19.—**CERAMIACEÆ**.—*Soft and thread-like; rarely rather rigid; jointed; transparent; or wholly or partly coated with colour-cells.*

1. *Masses of spores in external, closed cases (capsules), in pairs; or rarely naked.*
2. *Tetraspores, external, superficial, or half-immersed.*

MICROCLADIA; glandulosa.
 CERAMIUM; rubrum, botryocarpum, decurrens, Deslongchampsii, diaphanum, gracillimum, strictum, nodosum, fastigiatum, flabelligerum, echinotum, acanthonotum, ciliatum.
 DUDRESNAIA; coccinea.
 CROUANIA; attenuata.
 Ptilota; plumosa, elegans.
 HALURUS;* equisetifolius, simplicifilum.
 GRIFFITHSIA; barbata, Devoniensis, corallina, secundiflora, setacea.
 CORYNOSPORA;† pedicellata.
 SEIROSPORA;‡ Griffithsiana.
 CALLITHAMNION; plumula, cruciatum, floccosum, Turneri, barbatum, pluma, arbuscula, Brodiaei, tetragonum, brachiatum, tetricum, Hookeri, roseum, byssoideum, polyspermum, purpurascens, fasciculatum, Borreri, affine, tripinnatum, gracillimum, thuyoideum, corymbosum, spongiosum (or *granulatum*), Rothii, floridulum, mesocarpum, sparsum, Daviesii, virgatulum.

* Formerly *Griffithsia equisetifolia* (Fig. 244), and *G. simplicifilum* (Fig. 247).

† Formerly *Callithamnion pedicellatum* (Fig. 283).

‡ The bead-like fruit of this plant is incorrectly called *tetraspores* under Fig. 248. The true *tetraspores* are "scattered and pedunculate," as described by Areschoug, and such have been lately observed by Dr. Arnott on a specimen from Jersey.

CHLOROSPERMS.—(*Green Group.*)

Colour. Varying from bright grass-green to dark-green. In a few exceptional cases, purple and rose-red.

Fruit. Minute seeds called *Zoospores*, from having at one period a motion as of animal life; formed of the colouring matter (*endochrome*) in the cells or tubes of which the frond is composed; very rarely external.

Family 20.—*Spongy or soft and thread-like. Threads tubular, filled with liquid green colouring-matter (endochrome).*

Zoospores in external cases (capsules), or internal.

CODIUM; bursa, adhærens, amphibium, tomentosum.

VAUCHERIA; submarina, marina, velutina.

BRYOPSIS; plumosa, hypnoides.

Family 21.—**ULVACEÆ.**—*Soft; membranaceous; flat or thread-like; tubular. Composed of colour-cellules laid side by side; or containing colour-cells variously arranged.*

Zoospores internal.

PORPHYRA; laciniata, vulgaris.

BANGIA; fusco-purpurea, ciliaris, elegans.*

GONIOTRICHUM;† ceramicola.

ENTEROMORPHA; Cornucopiæ, intestinalis, compressa, Linkiana, erecta, clathrata, ramulosa, Hopkirkii, percura, Ralfsii.

PHYCOSERIS;‡ latissima, linza.

ULVA; lactuca.

* Of doubtful affinity. See under Fig. 350.

† Formerly *Bangia ceramicola* (Fig. 349); the change of name was accidentally omitted in its proper place.

‡ Formerly *Ulva latissima* (Fig. 342), and *U. linza* (Fig. 344). This subdivision of the *Ulvas* is scarcely established. The collector can adopt it or let it alone, as he pleases.

Family 22.—**CONFERVACEÆ.**—*Soft tufts of jointed threads. Joints containing liquid colouring matter (endochrome).*

Zoospores internal.

OCHLOCHÆTE; hystrix.

CLADOPHORA; Brownii, repens, pellucida, rectangularis, Macallana, Hutchinsii, diffusa, nuda, rupestris, lætevirens, flexuosa, gracilis, Balliana, Rudolphiana, refracta, albida, lanosa, uncialis, arcta, glaucescens, falcata, Magdalenæ, Gattiyæ, flavescens, fracta.

RHIZOCLONIUM; riparium, Casparyi.

*HORMOTRICHUM; collabens, bangioides, Younganum, Carmichaelii, speciosum, flaccum, Cutleriæ.

CONFERRA; arenicola, arenosa, littorea, Linum, sutoria, tortuosa, implexa, Melagonium, ærea, clandestina.

* Formerly *C. collabens* (Fig. 327), *Conferva bangioides* (Fig. 328), *C. Youngana* (Fig. 337), *Lyngbya Carmichaelii* (Fig. 368), *L. speciosa* (Fig. 369), *L. Cutleriæ* (Fig. 370), and *L. flacca* (Fig. 359).

Family 23.—OSCILLARIACEÆ.—*Solid masses or soft tufts of tubular threads, each thread containing a row of narrow cylindrical colour-cells.*

Zoospores internal.

RIVULARIA; plicata, atra, nitida.

CALOTHRIX; confervicola, luteola, scopulorum, fasciculata, pannosa, semiplena, hydroides, cœspitula.

SCHIZOTHRIX; Creswellii.

SCHIZOSIPHON; Warreniæ.

LYNGBYA; majuscula, ferruginea.

OSCILLATORIA; littoralis, spiralis, nigro-viridis, subuliformis, insignis.

MICROCOLEUS; anguiformis.

SPIRULINA; tenuissima.

Family 24.—NOSTOCHINEÆ.—*Soft tubular threads lying in gelatine, forming filmy patches; each thread containing a row of colour-cells, interrupted here and there by one of different character (heterocyst.)*

Zoospores internal.

SPERMOSTRA; littorea, Harveyana.

SPHÆROZYGA; Carmichaeli, Thwaitesii, Broomei, Berkeleyana.

MONORMIA; intricata.

Family 25.—PALMELLACEÆ.—*Soft, gelatinous, tubular threads, each containing a row of colour-cells.*

Zoospores internal; the colouring-matter (endochrome) dividing into rays.

HORMOSPORA; ramosa.

ALPHABETICAL TABLE OF GENERA AND SPECIES.

	Fig.		Fig.		Fig.
Actinococcus.		C. corymbosum	276	C. ciliatum	241
Hennedyi, <i>page 93, Vol. II.</i>		cruciatum	250	decurrens	231
Ahnfeldtia.		Daviesii	281	Deslongchampsii	236
plicata	211	fasciculatum	271	diaphanum	237
Alaria.		floccosum	263	echionotum	239
esculenta	23	floridulum	277	fastigiatum	235
Arthrocladia.		gracillimum	274	flabelligerum	238
villosa	20	Hookeri	268	gracillimum	232
Asperococcus.		mesocarpum	279	nodosum	234
compressus	44	pedicellatum	283	rubrum	242
echinatus	46	Pluma	267	strictum	233
Turneri	45	Plumula	254		
Bangia.		polyspermum	270	Champia.	
ceramicola*	349	roseum	260	parvula	153
ciliaris	348	Rothii	278	Chætopteris.	
elegans	350	sparsum	280	plumosa	72
fusco-purpurea	347	spongiosum	265	Chondria.	
Bonnemaisionia.		tetragonum	264	dasyphylla	144
asparagoides	133	tetricum	259	tenuissima	143
Bostrychia.		thuyoideum	275	Chondrus.	
scorpioides	139	tripinnatum	261	crispus	202
Bryopsis.		Turneri	266	Norvegicus	203
hypnoides	287	virgatulum	282	Chorda.	
plumosa	286	Callophyllis.		filum	31
Calliblepharis.		laciniata	179	lomentaria	32
ciliata	187	Calothrix.		Chordaria.	
jubata	188	cæspitula	366	divaricata	48
Callithamnion.		confervicola	353	flagelliformis	47
affine	273	fasciculata	362	Chrysomenia.	
arbuscula	262	hydroides	365	clavellosa	136
barbatum	256	luteola	361	rosea	141
Borreri	272	pannosa	357	rosea, var.	142
brachiatum	258	scopulorum	363	Chylocladia.	
Brodiaïi	257	semitplena	363	articulata	147
byssoidesum	269	Carpomitra.		clavellosa	136
		Cabrerae	22	kaliformis	146
		Catenella.		ovalis	145
		Opuntia	204	parvula	153
		Ceramium.		reflexa	138
		acanthonotum	240		
		botryocarpum	243		

* Italics indicate plants with changed names.

	Fig.		Fig.		Fig.
<i>C. rosea</i>	141	Corynospora.		Ectocarpus.	
<i>rosea, var.</i>	142	<i>pedicellata</i>	283	<i>amphibius</i>	85
Cladophora.		Crouania.		<i>brachiatus</i>	90
<i>albida</i>	324	<i>attenuata</i>	229	<i>crinitus</i>	91
<i>arcta</i>	310	Cruoria.		<i>distortus</i>	87
<i>Balliana</i>	303	<i>pellita</i>	227	<i>faciculatus</i>	82
<i>Brownii</i>	293	<i>pellita, page 92, Vol. II.</i>		<i>fenestratus</i>	86
<i>diffusa</i>	298	<i>adhaerens, page 92, Vol. II.</i>		<i>granulosus</i>	95
<i>falcata</i>	325	Cutleria.		<i>Hincksiae</i>	83
<i>flavescens</i>	314	<i>multifida</i>	33	<i>Landsburgii</i>	88
<i>flexuosa</i>	301	Cystoclonium.		<i>littoralis</i>	93
<i>fracta</i>	315	<i>purpurascens</i>	195	<i>longifructus</i>	94
<i>Gattyæ</i>	313	Cystoseira.		<i>Mertensii</i>	96
<i>glaucescens</i>	311	<i>barbata</i>	6	<i>pusillus</i>	92
<i>gracilis</i>	302	<i>ericoides</i>	4	<i>siliculosus</i>	81
<i>Hutchinsiae</i>	297	<i>fibrosa</i>	8	<i>sphaerophorus</i>	89
<i>laetevirens</i>	300	<i>fœniculacea</i>	7	<i>tesselatus, page 89, Vol. II.</i>	
<i>lanosa</i>	308	<i>granulata</i>	5	<i>tomentosus</i>	84
<i>Macallana</i>	296	Dasya.		Elachista.	
<i>Magdalenæ</i>	312	<i>Arbuscula</i>	152	<i>camabriensis, page 89, Vol. II.</i>	
<i>nuda</i>	307	<i>Cattloviæ (P), page 91, Vol. II.</i>		<i>curta</i>	63
<i>pellucida</i>	294	<i>coccinea</i>	135	<i>flaccida</i>	62
<i>rectangularis</i>	295	<i>ocellata</i>	137	<i>fucicola</i>	61
<i>refracta</i>	305	<i>punicea, page 91, Vol. II.</i>		<i>Grevillei, page 88, Vol. II.</i>	
<i>repens</i>	306	<i>venusta</i>	107	<i>Haydeni, page 88, Vol. II.</i>	
<i>Rudolphiana</i>	304	Delesseria.		<i>pulvinata</i>	66
<i>rupestris</i>	292	<i>alata</i>	171	<i>scutulata</i>	65
<i>uncialis</i>	309	<i>angustissima</i>	150	<i>stellulata</i>	64
Cladostephus.		<i>Hypoglossum</i>	172	<i>velutina</i>	67
<i>spongiosus</i>	73	<i>ruscifolia</i>	182	Enteromorpha.	
<i>verticillatus</i>	58	<i>sanguinea</i>	169	<i>clathrata</i>	333
Codium.		<i>sinuosa</i>	170	<i>compressa</i>	330
<i>adhaerens</i>	288	Desmarestia.		<i>Cornucopiæ</i>	339
<i>amphibium</i>	289	<i>aculeata</i>	18	<i>erecta</i>	332
<i>Bursa</i>	284	<i>Dresnæi, page 87, Vol. II.</i>		<i>intestinalis</i>	329
<i>tomentosum</i>	285	<i>ligulata</i>	17	<i>Hopkirkii</i>	335
Conferva.		<i>viridis</i>	19	<i>Linkiana</i>	331
<i>ærea</i>	326 b	Dictyosiphon.		<i>percursa</i>	340
<i>arenicola</i>	317	<i>fœniculaceus</i>	40	<i>Ralfsii</i>	341
<i>arenosa</i>	321	Dictyota.		<i>ramulosa</i>	331
<i>bangioides</i>	328	<i>dichotoma</i>	37	Euthora.	
<i>collabens</i>	327	Dudresnaia.		<i>cristata</i>	184
<i>implexa</i>	320	<i>coccinea</i>	220	Fucodium.	
<i>linum</i>	223	<i>divaricata</i>	221	<i>tuberculatum</i>	9
<i>littorea</i>	322	Dumontia.		<i>nodosum</i>	13
<i>Melagonium</i>	326 a	<i>filiformis</i>	209	<i>Mackaii</i>	14
<i>sutoria</i>	336	Cordylecladia.		<i>canaliculatum</i>	15
<i>tortuosa</i>	319	<i>erecta</i>	168	<i>anceps, page 87, Vol. II.</i>	
<i>Youngana</i>	337	Corallina.		Fucus.	
Corallina.		<i>officinalis</i>	148	<i>canaliculatus</i>	15
<i>officinalis</i>	148	<i>squamata</i>	149	<i>ceranoides</i>	11
Cordylecladia.		Cordylecladia.		<i>Mackaii</i>	14
<i>erecta</i>	168	<i>erecta</i>	168	<i>nodosus</i>	13

	Fig.		Fig.		Fig.
Gelidium.		Helminthora.		Lyngbya.	
cartilagineum . . .	192	divaricata . . .	221	<i>Carmichaelii</i> . . .	368
corneum . . .	199			<i>Cutleriae</i> . . .	370
Gigartina.		Hildenbrandtia.		ferruginea . . .	367
acicularis . . .	225	rubra . . .	161	<i>flacca</i> . . .	359
mamillosa . . .	194			majuscula . . .	358
pistillata . . .	197	Himanthalia.		<i>speciosa</i> . . .	369
Teedii . . .	201	lorea . . .	16	Melobesia.	
Ginannia.		Hormospora.		agariciformis . . .	159
<i>furcellata</i> . . .	226	ramosa . . .	360	calcareae . . .	159
Gloiosiphonia.		Hormotrichum.		farinosa . . .	164
capillaris . . .	219	collabens . . .	327	fasciculata . . .	158
Goniotrichum.		bangioides . . .	328	lichenoides . . .	160
ceramicola . . .	349	Younganum . . .	337	membranacea . . .	163
Gracilaria.		Carmichaelii . . .	368	polymorpha . . .	157
compressa . . .	193	speciosum . . .	369	pustulata . . .	166
confervoides . . .	198	flaccum . . .	359	verrucata . . .	165
<i>erecta</i> . . .	168	Cutleriae . . .	370	Mesogloia.	
multipartita . . .	196	Iridæa.		Griffithsiana . . .	56
Grateloupia.		<i>edulis</i> . . .	214	vermicularis . . .	55
filicina . . .	186	Jania.		virescens . . .	57
Griffithsia.		corniculata . . .	155	Microcladia.	
barbata . . .	250	rubens . . .	154	glandulosa . . .	230
corallina . . .	252	Kallymenia.		Microcoleus.	
Devoniensis . . .	251	<i>Dubyi</i> . . .	213	anguiformis . . .	371
<i>equisetifolia</i> . . .	245	reniformis . . .	215	Monormia.	
secundiflora . . .	246	Laminaria.		intricata . . .	378
setacea . . .	253	bulbosa . . .	26	Myrionema.	
<i>simplicifilum</i> . . .	217	digitata . . .	24	clavatum . . .	75
Gymnogongrus.		digitata, var. . .	25	Leclancherii . . .	69
Griffithsiae . . .	200	Fascia . . .	30	punctiforme . . .	70
<i>plicatus</i> . . .	211	longicruris . . .	27	strangulans . . .	68
Norvegicus . . .	203	Phyllitis . . .	29	Myriotrichia.	
Halidrys.		saccharina . . .	28	clavæformis . . .	97
siliquosa . . .	3	Laurencia.		filiformis . . .	98
Haliseris.		cæspitosa . . .	140	Naccaria.	
polypodioides . . .	34	<i>dasyphylla</i> . . .	144	Wiggii . . .	218
Halurus.		obtusa . . .	132	hypnoides, page 90, Vol. II.	
equisetifolius . . .	245	pinnatifida . . .	131	Nemaleon.	
simplicifilum . . .	247	<i>tenuissima</i> . . .	113	multifidum . . .	210
Halymenia.		Leathesia.		<i>purpureum</i> . . .	217
ligulata . . .	216	Berkeleyi . . .	59	Nitophyllum.	
Hapalidium.		tuberiformis . . .	54	Bonnemaisoni . . .	185
Phyllactidium . . .	162	crispa, page 88, Vol. II.		Gmelini . . .	176
Helminthocladia.		Litosiphon.		Hilliae . . .	175
purpurea . . .	217	<i>Laminaria</i> . . .	53	laceratum . . .	177
		<i>pusillus</i> . . .	52	punctatum . . .	173
		Lomentaria.		punctatum, var. . .	174
		ovalis . . .	145	versicolor . . .	181
		kaliformis . . .	416	Ochlochæte.	
		reflexa . . .	138	Hystrix . . .	338

	Fig.		Fig.		Fig.
Odonthalia.		Ptilota.		Seirospora.	
dentata	99	elegans	222	Griffithsiana	249
Oscillatoria.		P. plumosa	223	Spermosira.	
insignis	377	sericea	222	Harveyana	384
littoralis	372	Punctaria.		littorea	381
nigro-viridis	375	latifolia	42	Sphacelaria.	
spiralis	373	plantaginea	43	cirrhusa	77
subuliformis	376	tenuissima	51	filicina	74
Padina.		Pycnophycus.		fusca	78
Pavonia	35	tuberculatus	9	plumosa	72
Petrocelis.		Ralfsia.		racemosa	80
cruenta, page 92, Vol. II.	227	verrucosa	60	radicans	79
Peyssonelia.		Rhizoclonium.		scoparia	71
Dubyi	224	Casparyi	318	Sertularia	76
Phyllophora.		riparium	315	Sphærococcus.	
Brodiaei	207	Rhodomela.		coronopifolius	191
membranifolia	206	lycopodioides	100	Sphærozyga.	
palmettoides	228	subfusca	103	Berkeleyana	383
rubens	205	Rhodophyllis.		Broomei	382
Plocanium.		bifida	183	Carmichaelii	379
coccineum	178	Rhodymenia.		Thwaitesii	380
Polyides.		bifida	183	Spirulina.	
rotundus	212	ciliata	187	tenuissima	374
Polysiphonia.		cristata	184	Sporochnus.	
affinis	122	jubata	188	pedunculatus	21
atro-rubescens	130	laciniata	179	Spyridia.	
Brodiaei	120	palmata	189	filamentosa	244
byssoides	134	palmata, var.	190	Striaria.	
Carmichaeliana	118	Palmetta	180	attenuata	41
elongata	105	Rivularia.		Stenogramme.	
elongata, var.	106	atra	352	interrupta	167
elongella	117	nitida	353	Stilophora.	
fastigiata	127	plicata	351	Lyngbyæi	39
fibrata	113	Rytiplæa.		rhizodes	38
fibrillosa	123	complanata	108	Taonia.	
foetidissima, page 90, Vol. II.		fruticulosa	102	atomaria	36
formosa	110	oxyacantha, page 90, Vol. II.		Ulva.	
furcellata	126	pinastroides	104	Lactuca	343
Griffithsiana	116	thuyoides	101	latissima	342
nigrescens	121	Sargassum.		Linza	344
obscura	111	bacciferum	2	Vaucheria.	
parasitica	128	vulgare	1	marina	290
pulvinata	112	Schizomenia.		submarina	291
Richardsoni	115	Dubyi	213	velutina	292
simulans	125	edulis	214	Wormskioldia.	
spinulosa	114	Schizosiphon.		sanguinea	169
subulifera	129	Warreniæ	354	Wrangelia.	
urceolata	109	Schizothrix.		multifida	248
variegata	124	Creswellii	355	Wyattia.	
violacea	119	Scinaia.		Laminariæ	53
Porphyra.		furcellata	226	pusilla	52
laciniata	345			Zonaria.	
vulgaris	346			collaris	49
				parvula	50

PLATE I.

Fig. 1. SARGASSUM VULGARE.

Colour. When fresh, olive; when dry, reddish brown.

Substance. Tough, leathery.

Character of Frond. Stem and branches. Branches on each side the stem (*pinnate*); alternate; bearing distinct leaves. Leaves midribbed; oblong; toothed like a saw (*serrated*) at the edges; generally marked with minute dark dots (*pores*).

Measurement. From 12 to 18 inches long. Width of leaves, variable.

Air-vessels. Like tiny round balls, borne on flat stalks, springing from the angles of the branches (*axillary*).

Fructification. Minute seeds (properly called *spores*) in special receptacles; several on a branchlet just above the air-vessel.

Habitat. Atlantic Ocean. Tropical and sub-tropical coasts. Florida, Syria, &c. Drifted to our shores by oceanic currents; but very rarely.

Fig. 2. SARGASSUM BACCIFERUM.

Colour. When young, pale olive; clear; in age, foxy; when dry, black.

Substance. Tough, leathery; when dry, brittle.

Character of Frond. Stems and branches. Stems angularly bent. Branching irregular; sometimes from a central point in all directions. Branches bearing distinct leaves. Leaves midribbed, extremely narrow (*linear-lanceolate*) toothed like a saw (*serrated*) at the edges; without dots (*pores*).

Measurement. Indefinite; as it is found in masses, without a root.

Air-vessels. Like tiny round balls, smaller than in *S. vulgare*; generally tipped with a spine-like point, sometimes short, sometimes long; occasionally, without.

Fructification. Very rarely found. Like that of *S. vulgare*.

Habitat. Tropical and sub-tropical ocean, in both hemispheres; always floating.

This is the celebrated Gulf-weed which stayed the ships of Columbus. No root has ever been found on it. Its growth is by young branches sprouting from old broken ones. Forming ridges (or banks, as they are called) in the sea, from 10 to 20 yards wide, and of indefinite length.

Fig. 3. HALIDRYS SILIQUOSA.

Colour. When young, greenish olive; in age, glossy brown; when dry, black.

Substance. Tough, leathery.

Character of Frond. Stem and branches. Everywhere compressed; long and narrow with parallel sides (*linear*). Branching alternate; repeated. The whole plant at one level, as if cut out of paper.

Measurement. From 1 to 4 feet long; about $\frac{1}{12}$ of an inch wide.

Air-vessels. Long; pod-like; tipped with a point; marked by obscure lines across; internally, divided into compartments.

Fructification. Minute seeds (*spores*) in special receptacles, at the ends of the branches, thickening them.

Habitat. All round the coast. On rocks and in pools, at and below half-tide level; common.

Fig. 4. CYSTOSEIRA ERICOIDES.

Colour. When fresh, clear olive; giving out brilliant iridescent tints (blue and green) in the water. When dry, black.

Substance. Tough, leathery.

Character of Frond. Shrub-like. Stem cylindrical; thick; short; woody; beset with slender branches. Branches irregularly divided; closely set with short, thorn-like branchlets, incurved like a shoemaker's awl (awl-shaped). Altogether very bushy. Root, a large hard disk.

Measurement. From 1 to 2 feet long.

Air-vessels. Inflations in the branches. Very small, solitary, just below the receptacles.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles, cylindrical; lumpy with tubercles; beset with thorns.

Habitat. South of England. West and South of Ireland. On rocks near low-water mark and in tide-pools.

Often infested by a very minute, tufted, parasitic alga, *Elachista pulvinata*; for which see Plate XVI. Fig. 66.

PLATE II.

Fig. 5. CYSTOSEIRA GRANULATA.

Colour. When fresh, semi-transparent olive; when dry, black; except the younger shoots.

Substance. Tough, leathery; the young shoots more delicate.

Character of Frond. Shrub-like. Stem cylindrical; thick; short; covered with bulbous knobs, from each of which springs a branch. Branches slender, repeatedly divided and branched; irregularly set with thorn-like incurved branchlets, having a tendency to a knob-like origin.

Measurement. Stem, 7 to 8 inches; branches, 1 foot or more, long.

Air-vessels. Inflations in the upper part of the branches; two or three together; small; oblong.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles long and strongly tubercled; an occasional spine.

Habitat. South of England. Ireland generally. Rocky tide-pools.

Fig. 6. CYSTOSEIRA FIBROSA.

Colour. When fresh, yellowish olive; when dry, perfectly black.

Substance. Tough, leathery; when dry, brittle.

Character of Frond. Shrub-like. Stem, compressed; woody; very much branched. Branches very slender; the upper ones clothed with delicate thorn-like branchlets.

Measurement. 3 feet or more, long.

Air-vessels. Inflations in the branches towards the middle or lower part; oval, large, sometimes thorny; one, two, or three near each other; often very abundant on the plant.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles very long; clothed with delicate thorn-like branchlets.

Habitat. England, west and south. Ireland, frequent. Rocks near low-water mark; tide-pools; deep water.

Infested by a minute, tufted, parasitic alga, *Elachista flaccida*; for which see Plate XV. Fig. 62. The very large air-vessels distinguish this *Cystoseira* from every other.

Fig. 7. CYSTOSEIRA FÆNICULACEA.

Colour. When fresh, clear, pale olive-green; when dry, black.

Substance. Tough, leathery.

Character of Frond. Shrub-like. Stem a little compressed. Branches beset with rough points as if branchlets had been broken off. When young and growing in deep water, furnished with long, flat, cut-out, midribbed leaves, which afterwards become branches.

Measurement. From 1 to 2 feet long; of which the stem is from 4 to 6 inches.

Air-vessels. Inflations in the branches near the ends; small; narrow; oblong; one or two together.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles minute; very long.

Habitat. South and South-west of England. Jersey. Rocks in tide-pools.

Fig. 8. CYSTOSEIRA BARBATA.

Colour. When fresh, reddish-brown; when dry, perfectly black.

Substance. Tough, leathery.

Character of Frond. Shrub-like. Stem covered with bulbous knobs, from each of which springs a branch. Branches slender, cylindrical; many times divided and branched.

Measurement. From 12 to 14 inches long.

Air-vessels. Inflations in the upper part of the branches; one or two near together; chain-like.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them; tipped with a spine-like point.

Habitat. The Mediterranean. Said to have found its way to our shores formerly; but has not been found for half a century or more.

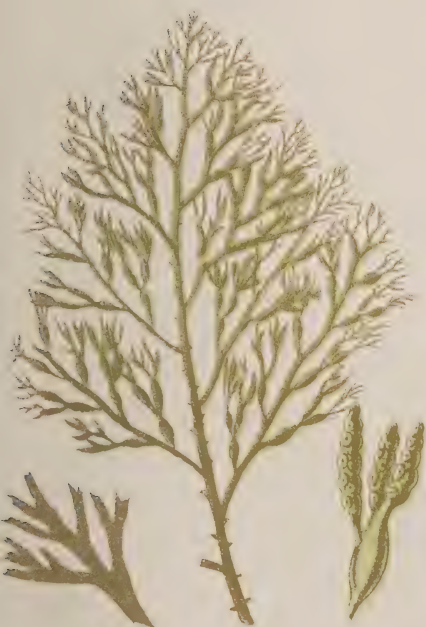
The spine-like point of the receptacle distinguishes *C. barbata* from *C. granulata*, with which its knob-like processes might otherwise confound it.



5.—*Cystoseira granulata*, Ag.



6.—*Cystoseira fibrosa*, Ag.



7.—*Cystoseira faniculacea*, Ag.



8.—*Cystoseira barbata*, Ag.

PLATE III.

Fig. 9. PYCNOPHYCUS TUBERCULATUS.

Colour. When growing, a fine olive; when dry, black.

Substance. Tough, leathery. Brittle when dry.

Character of Frond. Cylindrical; about as thick as a goosequill; branched. Branching, repeatedly forked (*dichotomous*). Root fibrous.

Measurement. From 12 to 20 inches long.

Air-vessels. Inflations in the branches; but often wanting.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles long; obtuse at the tips; tubercled; yellowish.

Habitat. Cornwall and Devonshire. West of Ireland. Jersey. In rock-pools near low-water mark.

By a change of classification and name, this plant is now *Fucodium tuberculatum*. The Family *Fucodium* comprehending also those members of the old Family *Fucus*, which are destitute of a midrib; viz. *F. nodosus*, *F. Mackaii*, and *F. canaliculatus*.

Fig. 10. FUCUS VESICULOSUS.

Colour. When fresh, olive-brown; when dry, black.

Substance. Tough, leathery; slimy feeling.

Character of Frond. Flat, midribbed, branched, occasionally twisted; branching, forked (*dichotomous*); margins smooth (*entire*).

Measurement. Sometimes extending to several feet in length. Dwarf varieties from 1 to 2 inches.

Air-vessels. Inflations in the branches; round; largish; mostly in pairs; often one on each side the midrib. But air-vessels are not unfrequently wanting.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches. Receptacles more or less oval; large; orange-coloured; slimy; tubercled.

Habitat. All round our coasts; abundant. On all rocks, stones, piers, quays, &c. which become exposed at low water. Up rivers too, in similar situations, as long as the water is brackish; but under such circumstances dwarfed and destitute of air-vessels.

A most widely distributed species. Found on the North Atlantic coasts, and extends even to the Tropics, Arctic Ocean, and Pacific coasts of N. America, Kamschatka, &c.

Fig. 11. FUCUS CERANOIDES.

Colour. A fine olive; clear. Becoming darker, but not black, when dry.

Substance. Much less leathery and tough than its relatives (*congeners*).

Described as *coriaceo-membranaceous*; i. e. leathery thin-skin, or thin-skinned leather!

Character of Frond. Flat, with clearly marked line of midrib; branched.

Branching partially forked (*sub-dichotomous*). Side branches alternate, then diverging into several forkings. Width very variable. Margins smooth (*entire*).

Measurement. From 1 to 2 feet long.

Air-vessels. None: though a tendency to inflation in the axils of the upper forkings is often perceptible.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches. Receptacles oval; a couple often forming the last forking; smaller than those of *F. vesiculosus*; orange-coloured, slimy, tubercled, but not so coarsely as those of *F. v.*

Habitat. Our shores generally; but not so common as the rest of the family. On rocks and stones between tide-marks; chiefly in places where rivers or other fresh waters run into the sea. Occasionally even in brackish water.

A very beautiful variety among the coarse Melanosperms, and an interesting plant to look for, from its not being so common as its brethren, and its greater refinement of appearance. It has been found thrown ashore at Filey.

Fig. 12. FUCUS SERRATUS.

Colour. A fine dark olive-green; glossy; retaining both its clearness and colour when dry.

Substance. Tough, leathery.

Character of Frond. Flat, midribbed, branched. Branching repeatedly forked (*dichotomous*). Width very variable. Margins always toothed like a saw (*serrated*), but more or less deeply so in different specimens.

Measurement. From 2 to 6 feet long; width very various.

Air-vessels. None.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches. Receptacles narrow-oval; flattish; not extending to the margins, which retain the notched (*serrated*) character of the rest of the frond.

Habitat. Our rocky shores generally. At half-tide level; very common.

The notched margins of this plant make it very easy of detection.



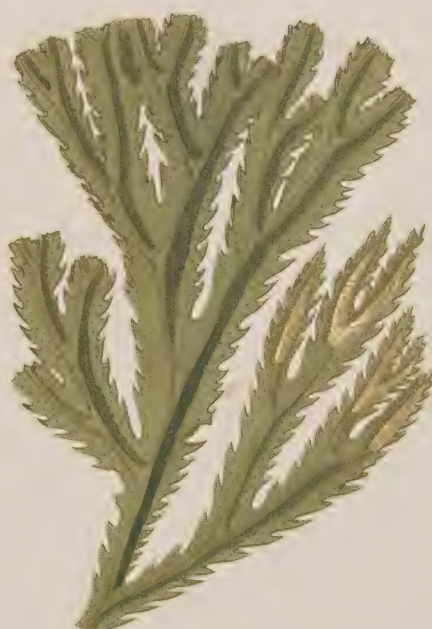
9.—*Pycnophycus tuberculatus*, Kütz.



10.—*Fucus vesiculosus*, Linn.



11.—*Fucus ceranoides*, Linn.



12.—*Fucus serratus*, Linn.

PLATE IV.

Fig. 13. FUCUS NODOSUS.

Colour. When fresh, olive-green; glossy; yellower in youth; when dry, black.

Substance. Densely tough and leathery.

Character of Frond. Compressed narrow straps, several springing from a root; thick; branched. Branching partly forked (*dichotomous*), partly on each side of a stem, like a feather (*pinnate*). Margins toothed (*serrated*) at remote intervals.

Measurement. From 2 to 6 feet long.

Air-vessels. Inflations in the branches, swelling them out far beyond the margins; very large, oblong.

Fructification. Minute seeds (*spores*) in special receptacles at the sides of the branches. Receptacles, globose; on stalks; growing from the axils of the marginal teeth; slimy; bright yellow.

Habitat. All round the coast; very common; between high-water mark and half-tide level.

Now *Fucodium nodosum*.

Fig. 14. FUCUS MACKAIL.

Colour. When fresh, dull olive-green; when dry, black.

Substance. Tough, leathery; when dry, rather horny.

Character of Frond. Cylindrical except at the base; slender; branched. Branching forked (*dichotomous*). Branches crowded, spreading.

Measurement. From 6 to 10 inches long.

Air-vessels. Inflations in the branches; here and there one, alone; longish oval; wider than the branch.

Fructification. Minute seeds (*spores*) in special receptacles at the sides of the branches towards the base. Receptacles on long drooping stalks; more or less ovate; sometimes one, sometimes two from a stalk; the two forming a fork.

Habitat. West of Ireland. On muddy sea-shores. Not rooted, but resting on mud or in gravel among large stones.

Now *Fucodium Mackaili*.

Fig. 15. FUCUS CANALICULATUS.

Colour. When fresh, olive-brown, or clear olive-yellow.

Substance. Tough, leathery; but not coarse.

Character of Frond. A tuft of narrow fronds from a root; branched. Branching repeatedly forked (*dichotomous*). Every part of the frond channelled or grooved on one side.

Measurement. From 2 to 6 inches long; from $\frac{1}{8}$ to $\frac{1}{6}$ of an inch wide.

Air-vessels. None.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches. Receptacles oblong; two from each tip forming a fork; lighter-coloured than the frond; slimy.

Habitat. Our rocky shores generally. Between high-water mark and half-tide level.

Now *Fucodium canaliculatum*. A pretty plant, and clearly marked by the groove or channel in its very narrow fronds, and by its growth in bushy tufts.

Fig. 16. HIMANTHALIA LOREA.

Colour. When fresh, olive; when dry, black.

Substance. Tough, leathery.

Character of Frond. Like a tiny leather peg-top standing upright. By degrees the top sinks in, and becomes cup-shaped. In the second year of growth, but not till then, it throws out long, strap-shaped receptacles from its centre.

Measurement. *Frond* about an inch high; *receptacles* from 2 to even 20 feet long; from $\frac{1}{6}$ to $\frac{1}{4}$ of an inch wide.

Air-vessels. None.

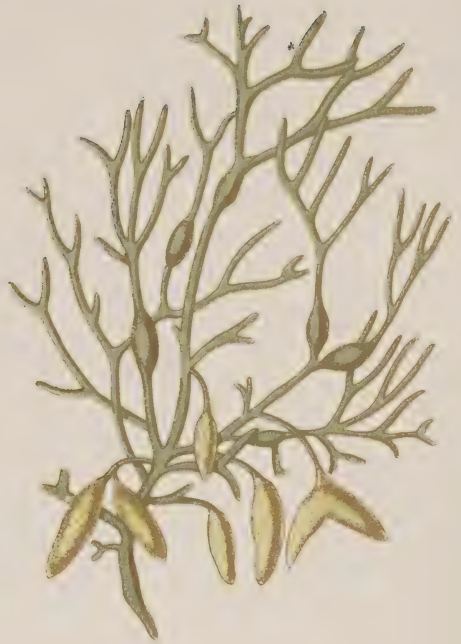
Fructification. Minute seeds (*spores*) in special receptacles springing from the centre of the frond, like narrow thongs of leather; several times branched in a forked manner (*dichotomously*); dark olive-green; slimy.

Habitat. On rocky shores generally. From low water-mark up to half-tide level.

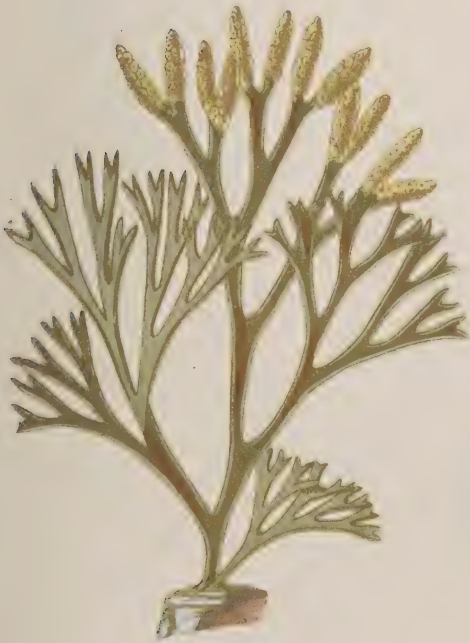
Rocks covered with the long slimy receptacles of this plant are dangerous walking ground. The usual comparison of a peg-top is retained in the above description; but to some eyes the one-year-old fronds of this species look like pale olive-coloured mushrooms or buttons, dotted about the rocks. The receptacles have a special parasite of their own; *Elachista scutulata*; a minute alga dotted about the thongs, like dark warts; for which see Plate XVI. Fig. 65. And another of the same family is frequently met with upon them; *Elachista velutina*; see Plate XVI. Fig. 67.



13.—*Fucus nodosus*, Linn.



14.—*Fucus Mackaii*, Turn.



15.—*Fucus canaliculatus*, Linn.



16.—*Himanthalia lorea*, Lyngb.

Fig. 17. DESMARESTIA LIGULATA.

Colour. When growing, a clear olive-brown; on exposure to the atmosphere, a verdigris-green; when dry, sometimes yellow; sometimes a pleasant green; semi-transparent.

Substance. Delicately membranaceous. Becoming limp (*flaccid*) after exposure to the air. Recovering itself when dry.

Character of Frond. Flat; with an obscure midrib towards the base; branched. Branching on each side of the stem; the branches branched again and again (repeatedly *pinnate*). Branches and branchlets in pairs exactly opposite each other, and all tapering at each end. The whole frond at one level as if cut out of paper (*distichous*). In youth the margins of the branches are fringed with minute tufts of cobweb-like fibres, which fall off as the plant advances in age.

Measurement. From 2 to 6 feet long; width varies very much.

Fructification. Not ascertained.

Habitat. South of England; occasionally north-east (Filey). All round the coast of Ireland. Between tide-marks, on rocks and stones.

In the north-west of Ireland a variety occurs, which is sometimes from 1 to 2 inches wide; called *D. Dresnii* by French botanists.

Fig. 18. DESMARESTIA ACULEATA.

Colour. When fresh and young, stems green olive; tufts bright green; on exposure to the atmosphere, verdigris-green; when dry, resuming its original hues. In age, brown.

Substance. Tender and membranaceous in youth. Becoming limp and sticky on exposure to the air. Recovering itself when dry. In age, harsh.

Character of Frond. Stem and branches. Stem very short; cylindrical. Branches long; very narrow; slender; flat; repeatedly rebranched. Margins, in youth, fringed with minute tufts of delicate bright green fibres; in age, with thorns.

Measurement. From 1 to 3 feet long.

Fructification. Not ascertained.

Habitat. Our coasts generally. On rocks near low-water mark; common.

A beautiful plant when young, from the bright green tufts which fringe its margins; but ugly when old. All three *Desmarestias* should, during collection, be kept apart from delicate red sea-weeds, as they possess some curious power of decomposing their more fragile neighbours.

Fig. 19. DESMARESTIA VIRIDIS.

Colour. When growing, a fine chestnut-olive; on exposure to air, turning verdigris-green; when dry, resuming its proper hue.

Substance. Tender and soon decomposing when gathered. Clinging in a sticky lump when exposed to the air. Recovering itself when dry.

Character of Frond. Thread-like, long, excessively branched. Branching uniformly opposite, on each side the stem, like a feather (*pinnate*). Branches repeatedly branched; always in the same manner; becoming finer in every series, till they resemble hairs.

Measurement. From 1 to 3 feet long.

Fructification. Not ascertained.

Habitat. Our shores generally. Between tide-marks; not uncommon.

Easy of detection from its exactly opposite branching throughout the whole frond. Though thread-like (*filiform*) in growth, it flattens when dried and pressed.

Fig. 20. ARTHROCLADIA VILLOSA.

Colour. Pale olive-green.

Substance. When fresh, stiff; soon becoming limp (*flaccid*) on exposure to the air.

Character of Frond. Thread-like, long, very slender stems; several from one base; branched. Branches distant, horizontal; on each side the stem; commonly opposite. Branchlets the same. Frond encircled (*whorled*) at short intervals with minute knobs (*nodes*) bearing very delicate, pale-green, jointed, threads (*filaments*).

Measurement. From six inches to nearly 3 feet long.

Fructification. Minute seeds (*spores*) in tiny pod-like receptacles, borne upon the hair-like filaments which surround the stems.

Habitat. South of England, Frith of Forth, Wicklow and Downshire coasts. Rather rare.

The distance of the branches from each other in this species characterises it even to those who do not look close enough to observe the *whorls* round the stems.



17.—*Desmarestia ligulata*, Lamour.



18.—*Desmarestia aculeata*, Lamour.



19.—*Desmarestia viridis*, Lamour.



20.—*Arthrocladia villosa*, Duby.

Fig. 21. SPOROCHNUS PEDUNCULATUS.

Colour. When fresh, olive brown; on exposure, yellow-green; its tufts when present, bright green.

Substance. Membranaceous; soft; delicate.

Character of Frond. A thread-like, long, simple stem, with long, slender, simple branches on each side. The whole frond crowded with very small, stalked receptacles.

Measurement. From 6 to 18 inches long.

Fructification. Minute seeds (*spores*) in very small, stalked receptacles, borne on the branches; each tipped with a crest of the finest, hair-like, bright green filaments, which fall off as the plant advances in age.

Habitat. Eastern and southern shores of England and Ireland; not very uncommon. Frith of Forth, Bridlington, Isle of Man, Portrane, &c.

Fig. 22. CARPOMITRA CABRERÆ.

Colour. Delicate olive-green.

Substance. When fresh, firm; rather gristly.

Character of Frond. Very narrow; flat; obscurely midribbed; branched. Branching forked (*dichotomous*), but not quite regularly so. Occasionally contracted as if drawn in. Root woolly.

Measurement. From 6 to 8 inches long.

Fructification. Minute seeds (*spores*) in special receptacles at the tips of the branches.

Habitat. South of England. Plymouth Sound. Ireland, Youghal, Co. Cork. Very rare. Thrown up from deep water.

The receptacles are called mitre-shaped, but the resemblance is not startling.

Fig. 23. ALARIA ESCULENTA.

Colour. A fine, bright olive when young; olive-brown when old.

Substance. Thin and tender, all but the midrib, which is gristly.

Character of Frond. A long, flat, ribbon-like, midribbed leaf. It grows on a stem, which at a certain age puts forth several small, flat, ribless leaflets on each side. Margins entire, except when torn. Root fibrous.

Measurement. From 2 to 12 feet or more, long.

Fructification. Minute seeds (*spores*) imbedded in the leaflets which fringe the stem, thickening and darkening them.

Habitat. Our northern shores generally. On rocks at low-water mark.

Plentiful in the lower ledges of rocks on the north side of Filey Bridge. The midrib is said to be eaten in many places.

Fig. 24. LAMINARIA DIGITATA.

Colour. From green to brownish olive; varying according to age.

Substance. Very tough; leathery.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem. *Stem*, when full-grown, solid; woody; as thick as a walking-stick; from 1 to 6 feet long. *Expansion*, rounded below; above, cut (except in extreme infancy) into several narrow slips (*segments*). Root, woody fibres.

Measurement. Stem, from 1 to 6 feet long. Expansion, from 1 to 5 feet long; from 1 to 3 feet wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our coasts generally. On rocks at low-water mark; common.

Popularly known as "The Great Tangle," "Oar-weed," or "Sea Girdles." The figure represents a plant which has just changed its coat; having grown a new one and thrust the old out of house and home! A sort of moulting in fact, on the principle of a deciduous tree, changing its leaves. The stem should have been coloured darker, being the older growth. The process is characteristic of the Laminarias.



21.—*Sporochnus pedunculatus*, Ag.



22.—*Carpomitra Cabrerae*, Kütz.



23.—*Alaria esculenta*, Grev.



24.—*Laminaria digitata*, Lamour.

PLATE VII.

Fig. 25. LAMINARIA DIGITATA. *Var. STENOPHYLLA.

Colour. Dark brown.

Substance. Tough; leathery.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem.
Stem, slender, soft, glossy. *Expansion,* wedge-shaped below; above, cut into a few narrow slips (*segments*), longer than the stem. Root fibrous.

Measurement. From 3 to 6 feet long.

Fructification. As before.

Habitat. The Orkney Islands. North and west of Ireland. Probably elsewhere, but overlooked.

Dr. Harvey considers this a remarkable variety of *Lam. digitata*, if not a separate species. He says the Orkney kelp-men distinguish the two by name; this being called "Tangle;" the common *L. digitata*, "Cury." French botanists make a species of it.

Fig. 26. LAMINARIA BULBOSA.

Colour. Dark; opaque; reddish or greenish brown; glossy; when dry, black.

Substance. Tough; leathery.

Character of Frond. A flat leafy expansion; ribless; growing from a stem.
Stem, flat, with a thin waved margin; once twisted at the base; rising from a roundish, hollow, rough bulb; throwing out numerous, stout, fibrous roots. *Expansion,* deeply cut into many narrow slips (*segments*).

Measurement. Stem, a foot or more long. Expansion, from 6 to 12 feet long, and 1 to 2 feet wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our coasts generally. In deep water, frequent.

Popularly called "Sea Furbelows," from the waved margins. The bulb has been found a foot in diameter.

Fig. 27. LAMINARIA LONGICRURIS.

Colour. A beautiful pale-green olive; the stem yellowish brown.

Substance. Thin; tender; very delicate.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem.

Stem, very long; slender at each end; swollen and hollow above the middle. *Expansion,* oval; with a wavy curled margin, as if frilled. Root fibrous.

Measurement. Stem from 8 to 12 feet long. Expansion, from 6 to 8 feet long; from two to three feet wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Abundant on N. American shores from Greenland to Cape Cod. Occasionally drifted to the coasts of Scotland and Ireland by oceanic currents.

But alas! only the *stems* of this fine plant have ever reached us; the delicate membranous leaf being always torn away in the voyage. Nevertheless, it is well to look out carefully, for a happy accident may bring us a complete frond some day. The stems are easily known from all others by their being hollow (*tubular*).

Fig. 28. LAMINARIA SACCHARINA.

Colour. When young, greenish olive; brownish when old.

Substance. When young, thin; more or less delicate; leathery when old.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem.

Stem, always short in proportion to expansion. *Expansion,* ribbon-like, long, and narrow. Margins sometimes wavy and curled, sometimes smooth. Fronds sometimes puckered down the sides. Root fibrous.

Measurement. Stem, from a few inches to several feet long. Expansion, from 2 to 12 feet long; from 4 to 16 inches wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our coasts generally. On rocks at low-water mark, and in deep water; common.

There may be a danger of confounding this plant, when young, with *L. Phyllitis*. Nevertheless, it is at all times thicker in substance, darker in colour, and more abrupt in growth at the base. Popularly called "The Devil's apron."



25.—*Laminaria digitata*, Lamour. {
(var. *stenophylla*.)



26.—*Laminaria bulbosa*, Lamour.



27.—*Laminaria longicurvis*, de la Pyl.



28.—*Laminaria saccharina*, Lamour.

PLATE VIII.

Fig. 29. LAMINARIA PHYLlyTIS.

Colour. Pale, yellowish green.

Substance. Thin and tender; delicately membranaceous; retaining these characters when old.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem.

Stem, always short in proportion to the *expansion*. *Expansion*, ribbon-like, very long and narrow, tapering gradually at each end. Margins wavy at times, yet scarcely as much curled as in *L. saccharina*. Root, fibrous.

Measurement. Stem, from 1 to 2 inches long. Expansion, from 8 inches to 3 feet long; from 1 to 6 inches wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our coasts generally. Between tide-marks, and at extreme low water, on rocks and in pools left by the tide. Not uncommon.

The tapering ends and more marked narrowness throughout, are guides to this plant, as well as its very delicate substance. When grown to its greatest length it never becomes leathery, coarse, or brown, like *L. saccharina*. Tufts of it grow together among boulders at extreme low-water mark, as on The Spittals, Filey.

Fig. 30. LAMINARIA FASCIA.

Colour. Olive, or olive-brown.

Substance. Membranaceous, but not quite so delicate as *L. Phyllytis*.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem.

Stem, very short. *Expansion*, often widening upwards, becoming blunt at the end; sometimes narrow throughout; sometimes wider below, and tapering upwards. Root, a minute disk.

Measurement. Stem, when longest, $\frac{1}{2}$ an inch; passing insensibly into the frond. Expansion, from 4 to 12 inches long. Width, from $\frac{1}{6}$ of an inch to an inch or two.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our shores generally. On mud-covered rocks. Not uncommon.

The little disk-like root stamps this species whenever it can be found; and the thick, dark, olive hue is another strong feature.

Fig. 31. CHORDA FILUM.

Colour. Dark olive-brown.

Substance. Gristly and very firm when recent; slimy; slipping through the fingers.

Character of Frond. Perfectly simple. Like long boot-laces; one from each minute disk-like root; growing in large companies, in sandy or muddy bottoms; cylindrical; tapering at both ends, clothed with pellucid hairs.

Measurement. From 1 to 20, or even 40 feet long in deep water. From $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. About as thick as a round slate-pencil.

Fructification. Minute seeds (*spores*) covering the whole surface of the frond.

Habitat. Our shores generally. From between tide-marks to ten or fifteen fathoms of water. Very abundant.

What has been considered a small variety, *C. tomentosum*, is densely covered with olive or green cobweb-like hairs. But Dr. Harvey believes this to be the case with all the *infant* plants of this species.

Fig. 32. CHORDA LOMENTARIA.

Colour. Brownish or yellowish olive.

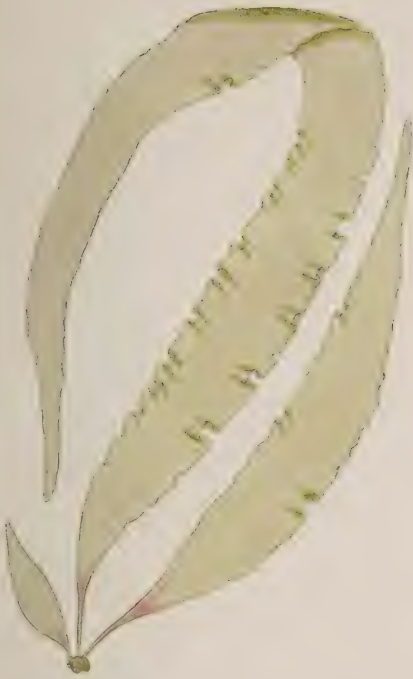
Substance. Soft, membranaceous.

Character of Frond. Perfectly simple. When young, like boot-laces, each from a minute disk-like root; more delicate in quality than *C. filum*; cylindrical; tapering at both ends; when full-grown, contracted at intervals as if tied in; the intervals inflated.

Measurement. From 3 to 16 inches long. One-third of an inch in diameter when largest. Often much smaller.

Fructification. Minute seeds (*spores*) covering the whole surface of the frond.

Habitat. Our coasts generally. On rocks and stones between tide-marks. Common.



29.—*Laminaria phyllitis*, *Lamour*.



30.—*Laminaria fascia*, *Ag.*



31.—*Chorda filum*, *Lamour*.



32.—*Chorda lomentaria*, *Lyngb.*

PLATE IX.

Fig. 33. CUTLERIA MULTIFIDA.

Colour. Olive-green, varied with rusty tints.

Substance. When fresh, firm, thick; membranaceous; soon becoming limp.

Character of Frond. A flat expansion; many times variously slit in the upper part; tips of the segments pointed. General outline rather fan-shaped. Beautifully marked by the prominent dots of fructification, of darker hue than the frond. Root, woolly.

Measurement. From 2 to 8 inches long.

Fructification. Dot-like tufts of seeds (*spores*) scattered over both surfaces of the plant.

Habitat. Coasts of England and Ireland. Very rare in Scotland. On rocks and shells in from 4 to 15 fathom water. Rare.

Fig. 34. HALISERIS POLYPODIOIDES.

Colour. Brownish olive; semi-transparent.

Substance. Thin; membranaceous; very easily torn.

Character of Frond. Flat; midribbed; narrowish throughout; branched. Branches forked (*dichotomous*), though not perfectly so. Margins entire. In tufts from a woolly root.

Measurement. From 4 to 12 inches long; about $\frac{1}{2}$ an inch wide.

Fructification. Minute seeds (*spores*) in oblong patches along each side of the midrib; or large single ones irregularly scattered.

Habitat. South of England, West and South of Ireland. Rocks and stones in the sea at from 2 to five fathoms depth. Rare.

When fresh its strong, disagreeable odour is a mark of distinction.

Fig. 35. PADINA PAVONIA.

Colour. Olive-green shaded with rust-colour; striped with lines across; some of these fringed with orange-coloured hairs; others dark. Outer surface powdered with white.

Substance. Leathery and opaque below; above, delicately membranaceous and transparent.

Character of Frond. A fan-like, semi-circular expansion; ribless; entire or slit into segments; each becoming fan-shaped in time. Margins rolled backwards; sometimes fringed with hairs. When young, growing in a curled, rolled-up manner (see figure). When old, expanded. Root woolly.

Measurement. From 2 to 5 or 6 inches high.

Fructification. Minute seeds (*spores*) on the upper surface of the frond, lying in bands across it; in fact, forming the *darker* striped lines described above.

Habitat. Southern shores of England. On rocks in shallow tide-pools at half-tide level. Rare.

A beautiful plant, supposed to resemble an outspread peacock's tail. The iridescent tints which its lines fringed with hairs give out in the water, assist this idea, suggested originally by its shape.

Fig. 36. TAONIA ATOMARIA.

Colour. Brownish olive, varied with green and rust tints; striped with lines across.

Substance. Thin; transparent; membranaceous.

Character of Frond. A flat expansion, deeply slit into many segments; several from a base. General outline rather fan-like; segments wedge-shaped. Tips blunt.

Measurement. From 3 to 12 inches long. Width of segments very irregular.

Fructification. Minute seeds (*spores*) on both surfaces of the frond; some forming waved lines across; some scattered irregularly between.

Habitat. East and South of England. Frith of Forth. South of Ireland. On rocks between tide-marks. Rare.



33.—*Cutleria multifida*, Lamour.



34.—*Halysidium palmatum*, Lamour.



35.—*Padina Pavonia*, Lamour.



36.—*Taonia atomaria*, Grev.

PLATE X.

Fig. 37. DICTYOTA DICHOTOMA.

Colour. Olive; more or less green or brown.

Substance. Thin; semi-transparent; membranaceous.

Character of Frond. Flat; ribless; narrowish throughout; branched. Branching, forked (*dichotomous*) throughout; the frond becoming narrower upwards. Margins entire. Root woolly.

Measurement. From 3 to 12 inches long. Width varying from $\frac{1}{3}$ of an inch to an almost hair-like fineness. The average width is represented in the figure.

Fructification. Minute seeds (*spores*) on both surfaces of the frond; either in oval clusters or irregularly scattered.

Habitat. Our shores generally. On rocks and sea-plants between tide-marks. Common.

The narrow variety (*D. intricata*) is troublesome to lay out; being truly "much branched, twisted, and entangled."

Fig. 38. STILOPHORA RHIZODES.

Colour. A greenish olive when young; when old, foxy brown.

Substance. Elastic and gristly when fresh, but soon turning soft and gelatinous in fresh water.

Character of Frond. Thread-shaped (*filiform*); solitary or tufted; branched. Branching irregular; mostly forked (*dichotomous*); occasionally alternate. Root, a disc.

Measurement. From 6 inches to 2 feet long.

Fructification. Minute seeds (*spores*) in convex, wartlike clusters, densely covering the surface of the frond, and giving it a dotted appearance.

Habitat. Shores of England and Ireland, Jersey. Near low-water mark, growing on rocks or algæ.

Fig. 39. STILOPHORA LYNGBYÆI.

Colour. A pale olive-brown, or foxy; becoming greenish olive in drying.

Substance. Membranaceous; crisp at first and fragile, soon turning soft.

Character of Frond. Thread-shaped (*filiform*), tufted, branched. Branching profuse, almost always forked (*dichotomous*); spreading; the tips very fine.

Measurement. From 2 to 4 feet long, or more.

Fructification. Minute seeds (*spores*) in convex, wart-like clusters, in lines encircling the branches; not nearly so thickly set as those of *S. rhizodes*.

Habitat. Land-locked bays on the coasts of Scotland and Ireland; dredged in from 4 to 10 fathom water.

S. rhizodes always grows within tide-marks. *S. Lyngbyæi* is only obtained from deep water. Dr. Harvey doubts of their being two distinct species.

Fig. 40. DICTYOSIPHON FÆNICULACEUS.

Colour. A greenish or brownish olive, according to age.

Substance. Membranaceous; soft; slippery to the touch when young, yet not gelatinous.

Character of Frond. Thread-shaped (*filiform*), tufted very fine. Very much branched and bushy. Main stem set with long, alternate branches on each side; branches re-branched once or twice; becoming hair-like at last. When young covered with colourless cobweb-like hairs, which die off afterwards.

Measurement. From 1 to many feet long.

Fructification. Minute seeds (*spores*) either solitary or clustered; scattered over the surface of the frond.

Habitat. Our coasts generally. Between tide-marks in pools, on rocks, or on other Algæ.

In general appearance like *Desmarestia viridis*, but the exactly *opposite* branching of that, and the *alternate* of this, perfectly distinguish the one from the other. The slippery feeling of young plants is produced by the hairs.



37.—*Dictyota dichotoma*, Lamour.



38.—*Stilophora albobrunnea*, J. Ag.



39.—*Stilophora Lyngbyæi*, J. Ag.



40.—*Dictyosiphon fœniculaceus*, Grev.

PLATE XI.

Fig. 41. STRIARIA ATTENUATA.

Colour. Pale olive.

Substance. Delicately membranaceous.

Character of Frond. Thread-shaped (*filiform*); tufted; branched. Stem branched on each side. Branches long, simple; or sometimes re-branched. Branches and branchlets mostly opposite; tapering at each end; marked, when in fructification, with dark rings or bands. Root, a disc.

Measurement. From 3 to 12 inches long.

Fructification. Minute seeds (*spores*) in clusters (accompanied by fibres), forming rings or bands round the branches.

Habitat. Our coasts generally. Growing on other algæ between tide-marks, and in from 4 to 5 fathom water.

The mode of branching varies occasionally; but the marked character of tapering extremities never fails.

Fig. 42. PUNCTARIA LATIFOLIA.

Colour. Pale olive-green; sometimes darker in age.

Substance. Thin; delicately membranaceous; semi-transparent; almost gelatinous when young; afterwards coarser.

Character of Frond. A leafy expansion; flat; ribless; more or less oblong; tapering suddenly at the base into a short stem; tip sometimes obtuse, and sometimes pointed; margins wavy; growing in tufts.

Measurement. From 8 to 16 inches long; from 1 to 3 wide.

Fructification. Dot-like groups of seeds (*spores*) scattered over both surfaces of the frond.

Habitat. Sidmouth and Torquay. Belfast and west of Ireland. On rocks and algæ between tide-marks. Not very common.

Fig. 43. PUNCTARIA PLANTAGINEA.

Colour. Brownish-olive; often full brown.

Substance. Tough, though membranaceous. Sub-opaque.

Character of Frond. A leafy expansion; flat; ribless; more or less pointed (*lanceolate*); tapering gradually to the base from near the middle of the frond.

Measurement. From 4 to 12 inches long; from $\frac{1}{2}$ to $1\frac{1}{2}$ inches wide.

Fructification. Oblong, largish groups of seeds (*spores*) scattered over both surfaces of the frond.

Habitat. Our coasts generally. On rocks, &c., between tide-marks. Not uncommon.

Sometimes confounded with *Laminaria fasciata*. But the *Laminaria* is more glossy; adheres less firmly to paper; and its texture, when examined through a microscope or lens, is seen to be much more close and compact than that of the *Punctaria*, which has a comparatively loose, reticulated (net-like) structure.

Fig. 44. ASPEROCOCCUS COMPRESSUS.

Colour. A yellowish, or olive-green.

Substance. Tender; membranaceous.

Character of Frond. A leafy expansion; compressed; ribless; narrow; tapering near the base into a hair-like stem, occasionally contracted at intervals as if drawn in.

Measurement. From 6 to 18 inches long; from $\frac{1}{4}$ to 1 inch wide.

Fructification. Oblong, irregular clusters of seeds (*spores*), scattered over both surfaces of the frond.

Habitat. South of England. Cast up from deep water. Rare.

Formed of two membranes, close-pressed and adhering. A species intermediate between *Punctaria* and the more characteristic *Asperococci*, which are tubular and inflated.



41.—*Striaria attenuata*, Grv.



42.—*Punctaria latifolia*, Grv.



43.—*Punctaria plantaginea*, Grv.



44.—*Asperococcus compressus*, Griff.

PLATE XII.

Fig. 45. ASPEROCOCCUS TURNERI.

Colour. Pale olive, when young; olive-brown, in age.

Substance. Thin; delicately membranaceous; semi-transparent.

Character of Frond. Tubular; inflated; oblong; obtuse at the tips; suddenly contracted at base into a short stem. Contracted at intervals, as if tied in, sausage fashion!

Measurement. From 8 inches to many feet in length; from $\frac{1}{2}$ to 2 or 6 inches thick.

Fructification. Dot-like clusters of seeds (*spores*) scattered over the surface of the frond.

Habitat. Our coasts generally. On stones, and the larger algæ, between tide-marks.

Known from *A. compressus* by being inflated; from *A. echinatus*, by its more transparent delicate texture, constrictions, and greater inflation of frond.

Fig. 46. ASPEROCOCCUS ECHINATUS.

Colour. Yellowish-olive, tending to brown.

Substance. Membranaceous, but coarse, and sub-opaque.

Character of Frond. Tubular; narrow; more or less tapering to the base; obtuse, or somewhat tapering, at the tips (the plate does not give the obtuse form, which is nevertheless common).

Measurement. From 2 inches to 2 feet long; from a hog's bristle to $\frac{1}{2}$ an inch in diameter, *i.e. thick*.

Fructification. Dot-like clusters of seeds (*spores*) scattered over the surfaces of the frond.

Habitat. Our coasts generally. On rocks and algæ between tide-marks. Common.

The great variety of size in this plant is puzzling to young collectors. But even when not thicker than a *hog's bristle* (a curiously favourite measure with phycologists!), it is still *tubular*; and like its relatives (*congeners*), often full of sand!

Fig. 47. CHORDARIA FLAGELLIFORMIS.

Colour. Dark olivaceous green; inclining to brown.

Substance. Firm and sinewy.

Character of Frond. Thread-like (*filiform*); branched; of equal thickness throughout. Stem branched on each side. Branches long, alternate, mostly simple; occasionally a few branchlets upon them. Fringed all over with fine, colourless hairs, which can only be seen when it is under water, but give it a slimy feel when out.

Measurement. From 3 inches to 3 feet long; from 1 to 2 hog's bristles thick.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Our coasts generally. On rocks and stones between tide-marks. Common.

The hairs give this plant a feathery appearance in the water.

Fig. 48. CHORDARIA DIVARICATA.

Colour. Olive; much paler than *C. flagelliformis*; brown in old age, and when dried.

Substance. Firm and elastic; surface slimy.

Character of Frond. Thread-like (*filiform*), branched; forming globose tufts. Branching partially forked (*sub-dichotomous*). Branches wavy, furnished in the upper part with scattered, short, mostly forked, branchlets.

Measurement. From 1 to 3 feet long. A hog's bristle thick.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Belfast and Carrickfergus. Thrown up from deep water. Rare.

Outwardly resembling *Stilophora rhizodes*.



45.—*Asperococcus furcata*, *Holt.*



46.—*Asperococcus echinatus*, *Grev.*



47.—*Chordaria flagelliformis*, *Ag.*



48.—*Chordaria divaricata*, *Ag.*

PLATE XIII.

Fig. 49. ZONARIA COLLARIS.

Colour. Olive-green; obscurely striped across.

Substance. Membranaceous; delicate.

Character of Frond. A fan-like, circular expansion, lying flat on the rocks; rooted from its under surface; sending from its upper one, small saucer-shaped fronds, which in pressing become flat.

Measurement. From 1 to 2 inches across.

Fructification. Minute seeds (*spores*) scattered over the surface of the frond.

Habitat. Jersey; found by Miss Turner, "lying among other algæ on the sand in Granville Bay."

Dr. Harvey considers the fronds so found to be secondary ones, sprung from the primary *Materfamilias*, adherent to the rock. *Zonarias* differ from *Padinas* in the irregular distribution of their spores. In *Zonaria*, these are scattered; in *Padina*, grouped in lines or bands. (See Plate IX. Fig. 35.) But the genera are closely allied, and it is only for the artist's convenience that they have been separated in this volume.

Fig. 50. ZONARIA PARVULA.

Colour. Olive-green; paler in shallow water than in deep.

Substance. Membranaceous; somewhat transparent.

Character of Frond. Flat; spreading over rocks in patches of roundish or oval outlines; rooted by fibrous hairs from its under surface, except towards the margins, which are free and divided into segments. Segments rounded, obscurely marked with lines.

Measurement. From 1 to several inches in diameter.

Fructification. Like that of *Zonaria collaris*; but it has not been observed in England.

Habitat. Our coasts generally. On rocks and corallines between tide-marks, and in deep water. Not uncommon.

Probably often overlooked from its hiding in crevices, &c.

Fig. 51. PUNCTARIA TENUISSIMA.

Colour. Pale green-olive when young; brown when old.

Substance. Delicately membranaceous; very thin; when young, transparent.

Character of Frond. Very narrow, long, flat; in tufts, forming a fringe on the fronds of various algæ. Tapering at each end. Margins more or less toothed.

Measurement. From 2 to 8 inches long; from $\frac{1}{12}$ to $\frac{1}{4}$ of an inch wide.

Fructification. Unknown.

Habitat. Our shores, here and there. On *Chorda filum*, &c. Not common.

For the other *Punctarias* see Plate XI.

Fig. 52. LITOSIPHON PUSILLUS.

Colour. Olive-brown.

Substance. Soft; membranaceous; slimy.

Character of Frond. Long thread-like (*filiform*) tufts; unbranched; of equal thickness throughout; clothed with hairs; growing in patches on old fronds of *Chorda filum*.

Measurement. From 2 to 6 inches long; thickness, a hog's bristle.

Fructification. Minute seeds (*spores*), solitary or in clusters; scattered over the surface of the frond.

Habitat. Our coasts generally. Always parasitic on *Chorda filum*. Common.

This genus is now called, by Continental botanists, *Wyattia*, after Mrs. Wyatt.

Fig. 53. LITOSIPHON LAMINARIÆ.

Colour. Dull olive-brown; marked with bands across.

Substance. Soft; membranaceous.

Character of Frond. Short, thread-like (*filiform*), starry tufts; unbranched; smooth (or hairy at the tips); blunt upwards; scattered dot-like on the frond of *Alaria esculenta*.

Measurement. From $\frac{1}{4}$ to $\frac{1}{2}$ an inch long; thickness, a hog's bristle.

Fructification. Minute seeds (*spores*) solitary, scattered; or several in each band across.

Habitat. Our coasts generally. Always parasitic on *Alaria esculenta*. Common.

Now *Wyattia laminariæ*.

Fig. 54. LEATHESIA TUBERIFORMIS.

Colour. Olive-brown.

Substance. Fleshy; elastic; slippery-feeling.

Character of Frond. More or less globose; forming tubers of various sizes and shapes; full of cottony fibres when young; hollow and inflated when older; adhering to rocks in large patches, or growing on the fronds of other algæ.

Measurement. Every size, from a pea to a large walnut.

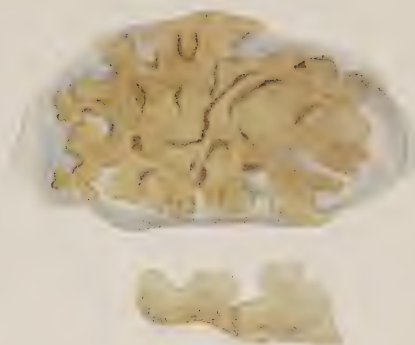
Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. All round our coasts. On rocks and algæ between tide-marks; abundantly.

Called *tuberiformis*, or tuber-shaped, from its resemblance "to a cluster of potatoes." For another *Leathesia* see Plate XV.



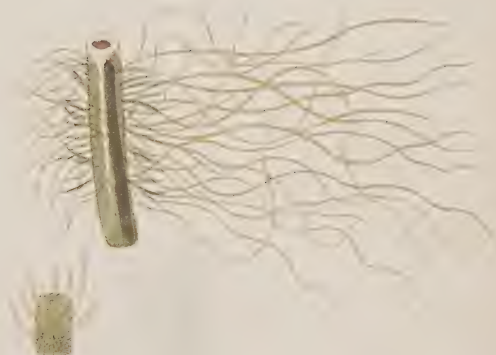
49.—*Zonaria collaris*, Ag.



50.—*Zonaria parvula*, Grev.



51.—*Punctaria tenuissima*, Grev.



52.—*Litosiphon pusillus*, Harv.



53.—*Litosiphon Laminariæ*, Harv.



54.—*Leathesia tuberiformis*, S. F. Gray.

PLATE XIV.

Fig. 55. MESOGLOIA VERMICULARIS.

Colour. Brownish olive.

Substance. Soft; thick; gelatinous; slipping from the hand.

Character of Frond. Cylindrical; unequally distended; branched. Branches long, worm-like, clumsy, attenuated at each end; irregularly set on a stem which is occasionally forked. Branchlets long, wavy; like the branches.

Measurement. From 1 to 2 feet long.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Our shores generally. On rocks and stones between tide-marks. Pretty common.

The slippery, worm-like feel of the *Mesogloias* renders the family easy of recognition; and *M. vermicularis* is much darker-coloured, thicker, and more clumsily formed than the others.

Fig. 56. MESOGLOIA GRIFFITHSIANA.

Colour. Rather pale olive-green, becoming greener in fresh water.

Substance. Soft; gelatinous; slimy; slipping from the hand.

Character of Frond. Cylindrical, slender, equal throughout; branched. Branches long, nearly simple, on each side a stem; mostly alternate; a few branchlets here and there. Surface covered with colourless, cobweb-like hairs which only show under water.

Measurement. From 8 to 16 inches long. About the thickness of a crow's quill.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. South of England. West of Ireland. In rock-pools between tide-marks. Rare.

Very like *Chordaria flagelliformis* in general growth, but differing in structure.

Fig. 57. MESOGLOIA VIRESCENS.

Colour. Olive-green; often yellowish.

Substance. Soft, gelatinous, slimy; loose as if likely to tumble to pieces.

Character of Frond. Cylindrical, slender, excessively branched. Branches long, spreading, on each side a stem; irregularly alternate; furnished with numbers of short branchlets. The whole frond looking hairy when examined; partly from its loose structure; partly from the colourless cobweb-like hairs with which it is clothed.

Measurement. From 8 to 12 inches long. About the thickness of a crow's quill.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Our coasts generally. On rocks, stones, and algæ, at half-tide level. Common.

The structure of the *Mesogloias* is on the model of that of a bottle brush; namely, a stalk surrounded with bristles. So the *Mesogloias* have a firm, internal stalk (*axis*), with radiating filaments surrounding it. These filaments, however, being delicate, and invested with gelatine, the plants are all slimy-feeling to the touch.

Fig. 58. CLADOSTEPHUS VERTICILLATUS.

Colour. A dull green, inclined to olive: darker and browner when old.

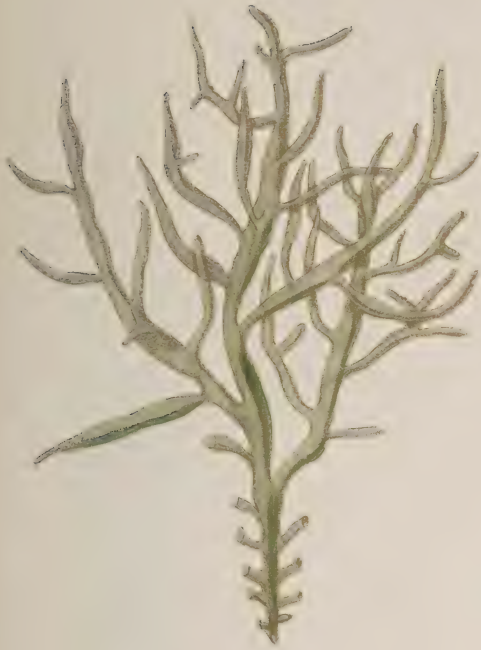
Substance. Rigid; harsh.

Character of Frond. Bushy. Branches slender, cylindrical; partly forked (*dichotomous*), partly alternate or opposite, on each side a stem. Stem and branches frilled (*whorled*) at short intervals with short, incurved branchlets; which are *jointed*, that is, composed of cells joined together in a line. Many of these drop off during winter.

Measurement. From 3 to 9 inches high.

Fructification. Oval seeds (*spores*) borne on small branchlets which grow irregularly on the frond after the summer frills (*whorls*) die off.

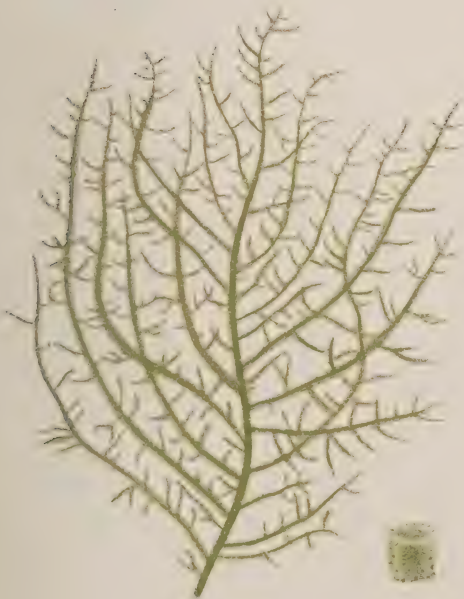
Habitat. Our coasts generally, except the north-east. On rocks and corallines.



55.—*Mesogloia vermicularis*, Ag.



56.—*Mesogloia crinitissima*, Ag.



57.—*Mesogloia virescens*, Carm.



58.—*Cladostephus verticillatus*, Ag.

PLATE XV.

Fig. 59. LEATHESIA BERKELEYI.

Colour. Dark brown.

Substance. Fleshy; soft; solid.

Character of Frond. Convex lumps, somewhat depressed; more or less globose; growing in patches upon rocks.

Measurement. From 1 to 2 inches in diameter. From $\frac{1}{4}$ to $\frac{1}{2}$ an inch thick.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. South of England. West of Ireland. On rocks between tide-marks.

For another *Leathesia*, see Plate XIII. Fig. 54.

Fig. 60. RALFSIA VERRUCOSA.

Colour. Dark brown.

Substance. Leathery; hard.

Character of Frond. *Crustaceous*; *i. e.* an incrustation, forming lichen-like patches on rocks. When young, circular in outline; becoming very irregular when old. The surface of young specimens flat. That of full-grown ones rough with wart-like prominences.

Measurement. Patches from 1 to 6 inches in diameter.

Fructification. Minute seeds (*spores*) in the wart-like prominences, scattered over the surface of the frond.

Habitat. Our coasts generally. On rocks between tide-marks. Common.

Fig. 61. ELACHISTA FUCICOLA.

Colour. Olive; or rusty brown.

Substance. Soft; membranaceous.

Character of Frond. A small, very dense tuft (rising from a tubercle), parasitic on *Fucus vesiculosus*. Threads (*filaments*) of the tuft, simple; tapering to the tips; jointed.

Measurement. About an inch long when full-grown.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Our coasts generally. On *Fucus vesiculosus*. Very common.

Fig. 62. ELACHISTA FLACCIDA.

Colour. Dull olive-brown.

Substance. Soft; membranaceous.

Character of Frond. A small, dense tuft (rising from a tubercle); parasitic on *Cystoseira fibrosa*. Threads of the tuft simple; tapering to the base; jointed.

Measurement. Half an inch long.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Our coasts generally. On *Cystoseira fibrosa*, common.

Fig. 63. ELACHISTA CURTA.

Colour. Pale olive.

Substance. Rather rigid.

Character of Frond. Very minute tufts (rising from a tubercle); parasitic on *Fuci*. Threads (*filaments*) of the tuft very short; tapering to the base; jointed.

Measurement. From $\frac{1}{12}$ to $\frac{1}{4}$ of an inch long.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Swansea. On *Fuci*, between tide-marks.

A plant which has not been found for many years; and the re-finding of which would well reward the trouble of search.

Fig. 64. ELACHISTA STELLULATA.

Colour. Olive-brown.

Substance. Soft; membranaceous.

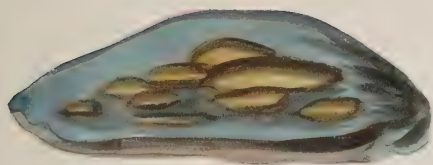
Character of Frond. Extremely minute, starry tufts (rising from a tubercle); parasitic on *Dictyota dichotoma*. Threads (*filaments*) of the tuft short; tapering to the base, thickening upwards to a blunt point (*clavate*); jointed.

Measurement. About $\frac{1}{24}$ of an inch in diameter.

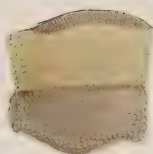
Fructification. Probably like that of the other *Elachistas*. Dr. Harvey has not yet found it.

Habitat. Torquay. On the fronds of *Dictyota dichotoma*.

It is not known that any one has met with this alga since Mrs. Griffiths discovered it at Torquay a few years ago. Unless closely examined under the microscope, it may be mistaken for the fruit of *Dictyota dichotoma*. Dr. Harvey describes the tufts as resembling "minute stars, or Echini." It well deserves further search.



59.—*Leathesia Berkeleyi*, Harv.



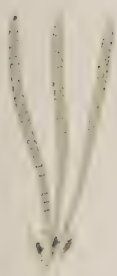
60.—*Radisia verrucosa*, Aresch.



61.—*Elachista tinicola*, Erix.



62.—*Elachista flaccida*, Aresch.



63.—*Elachista curta*, Aresch.



64.—*Elachista stellulata*, Griff.

PLATE XVI.

Fig. 65. ELACHISTA SCUTULATA.

Colour. Dark brown.

Substance. Soft; slippery feeling.

Character of Frond. Dark, oblong, convex patches, densely clothed with very short threads (*filaments*); parasitic on the receptacle thongs of *Himanthalia lorea*. Filaments jointed.

Measurement. Patches, $\frac{1}{2}$ an inch or more in length. Filaments, $\frac{1}{4}$ to $\frac{1}{3}$ inch long.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Our coasts generally. On *Himanthalia lorea*.

These tubercles are formed of densely packed, branching fibres, whence issue filaments. They surround the *Himanthalia* thongs, like dark warts; sometimes completely covering them for the space of several inches; very slippery to the touch.

Fig. 66. ELACHISTA PULVINATA.

Colour. Olive.

Substance. Rather rigid.

Character of Frond. Very minute globose tufts (rising from a tubercle); parasitic on the fruiting branches of *Cystoseira ericoides*. Threads (*filaments*) of the tufts very short; tapering greatly to both ends; jointed.

Measurement. About $\frac{1}{12}$ of an inch in diameter.

Fructification. Minute seeds (*spores*) at the base of the threads.

Habitat. South of England. West of Ireland. On *Cystoseira ericoides*.

A beautiful microscopic object, says Dr. Harvey. The plant it infests looks under a common lens as if spotted with minute hairy warts. It was first found by Kützinger.

Fig. 67. ELACHISTA VELUTINA.

Colour. Pale olive.

Substance. Soft; velvety.

Character of Frond. Thin, irregular patches, clothed with very short threads (*filaments*); parasitic on the receptacle-thongs of *Himanthalia lorea*, and some say of *Fucus serratus*. Filaments very minute, one thickness throughout; jointed.

Measurement. Patches, $\frac{1}{2}$ an inch or more in extent. Filaments, $\frac{1}{12}$ to $\frac{1}{10}$ inch long.

Fructification. Minute seeds (*spores*) stalked; at the base of the filaments.

Habitat. Our shores generally. On *Himanthalia lorea*.

Difficult to distinguish from *E. scutulata* (with which it is often found) except by the form of the spores which require microscopic examination. Nevertheless, the thin, velvety layer of this, and the wart-like prominence of the other, are always marks of distinction.

Fig. 68. MYRIONEMA STRANGULANS.

Colour. Dark-brown.

Character of Frond. Minute; parasitic; forming a small, convex, dark-brown, dot-like patch on a flat frond; a ring-like collar round a filiform one. Filaments jointed.

Measurement. A dot or an encircling patch, varying in extent. Filaments excessively short.

Fructification. Minute seeds (*spores*) nestling among the threads (*filaments*) of the frond.

Habitat. Our coasts generally. On *Ulvæ* and *Enteromorphæ*.

The dark-brown specks and bands formed by this plant on the green fronds of *Ulvæ*, &c., may easily be mistaken for symptoms of decay, if not carefully examined. They consist of numerous short, upright, jointed threads, springing from a thin expansion composed of decumbent ones. But it requires a microscope and skill to find all this out. The general appearance is soon learnt.

Fig. 69. MYRIONEMA LECLANCHIERII.

Colour. Olive.

Character of Frond. Minute; parasitic; forming round, flat, olive-coloured patches on the fronds of *Rhodymenia palmata* and *Ulva latissima*, making them look as if spotted with decay. Filaments jointed.

Measurement. The patches sometimes extend to $\frac{1}{4}$ of an inch of diameter. Filaments excessively short.

Fructification. Minute seeds (*spores*) nestling among the threads (*filaments*) of the frond.

Habitat. Our shores generally. On *Rhodymenia palmata*; and on *Ulva latissima*, in deep water.

Thinner and lighter coloured than *M. strangulans*, and spreading in much larger patches.

Fig. 70. MYRIONEMA PUNCTIFORME.

Colour. Dark-olive.

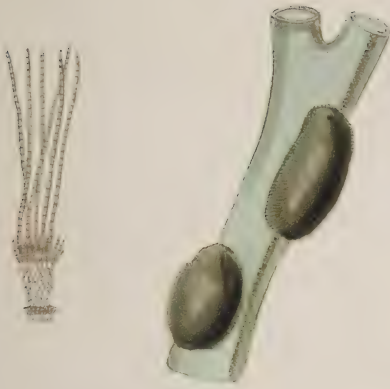
Character of Frond. Minute; parasitic; convex; forming globose dots on *Ceramium rubrum*, &c.

Measurement. A dot!

Fructification. Minute seeds (*spores*) among the threads (*filaments*) of the frond.

Habitat. Our coasts generally. On several red sea-weeds.

Easily mistaken for little bits of dirt, unless examined. For another *Myrionema* see Plate XVIII. Fig. 75.



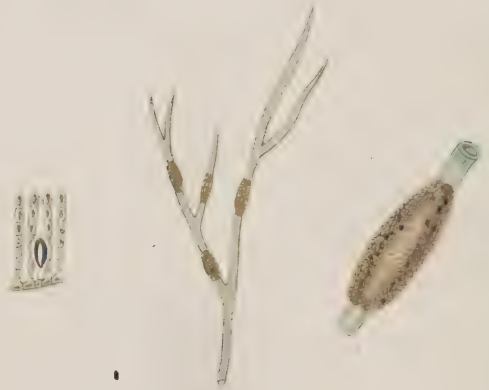
65.—*Elachista scutulata*, Duby.



66.—*Elachista pulvinata*, Harv.



67.—*Elachista velutina*, Harv.



68.—*Myrionema strangulans*, Grev.



69.—*Myrionema Leclancherii*, Harv.



70.—*Myrionema punctiforme*, Harv.

PLATE XVII.

Fig. 71. CLADOSTEPHUS SPONGIOSUS.

Colour. Dull-brown or dirty olive-green.

Substance. Rigid; rough; spongy.

Character of Frond. A clumsy little bush. Branches thick, obtuse, cylindrical; irregularly forked (*dichotomous*). Densely (but irregularly) clothed with short branchlets, so thickly crowded that they overlap each other. Branchlets jointed; falling off in winter.

Measurement. From 3 to 4 inches long.

Fructification. Oval seeds (*spores*); stalked; borne on a special set of minute branchlets which grow irregularly over the branches when the summer set dies off.

Habitat. Our coasts generally. On rocks and stones between tide-marks. Common.

Known from *C. verticillatus*, by the irregular distribution of the summer branchlets; contrasting unfavourably with the orderly frills (*whorls*) of them at regular distances in *C. verticillatus*. For *C. verticillatus* refer back to Plate XIV. Fig. 58.

Fig. 72. SPHACELARIA FILICINA.

Colour. A beautiful green-olive.

Substance. Firm, somewhat rigid, but delicate.

Character of Frond. Delicately bushy. Stem and branches jointed throughout; thread-like (*filiform*). Stem shaggy at base; slender; irregularly branched; often bearing at the top several branches displayed like a fan. Branches alternate. Branches and branchlets twice branched; lanceolate in outline; all the angles of branching acute.

Measurement. From 2 to 4 inches long.

Fructification. Oval seeds (*spores*) borne on the branchlets in winter.

Habitat. South of England and Ireland; Jersey. Very rare.

No description can do justice to this beautifully delicate little plant. Were it the handywork of man, we should exclaim at the exquisite skill betrayed by its elaborately worked-out and tasteful construction. This species, like all its relatives (*congeners*) is subject to what is considered a *withering* of the tips of the branchlets, which become partially colourless, partially filled with a dark substance, the nature of which is not known.

Fig. 73. SPHACELARIA SCOPARIA.

Colour. Olive-green when young; when old, rusty and dark-brown.

Substance. Rigid; robust.

Character of Frond. Bushy. Stem and branches jointed throughout; thread-like (*filiform*). Stem shaggy at base; robust; irregularly branched; the main divisions spreading at their summit into dense tufts of branchlets. Branches alternate; re-branched twice or even three times.

Measurement. From 2 to 4 inches long.

Fructification. Globose seeds (*spores*) borne on the branchlets in winter.

Habitat. Southern coasts of England, common. Frith of Forth. Irish coast in several places, but not common.

This plant is prettiest in winter, when so many of its crowded branches have died off, that it looks a much more suitable brother of *S. filicina* than in its shaggy summer state.

Fig. 74. SPHACELARIA PLUMOSA.

Colour. Olive-green.

Substance. Rigid, but delicate.

Character of Frond. Delicately bushy. Stem and branches partially jointed; thread-like (*filiform*). Stem not jointed; many from one base; smooth, longish, irregularly branched. Branches exactly opposite; re-branched with short simple branchlets, like a feather (*pinnate*); tufted or scattered; from $\frac{1}{2}$ to $1\frac{1}{2}$ inch long; resembling feathers.

Measurement. From 2 to 6 inches long.

Fructification. Oval seeds (*spores*) borne on the branches in winter.

Habitat. Several places from Orkney to the Land's End; but much more luxuriant in the north, and nowhere common.

The branching is so irregular that specimens have often quite a ragged appearance. But it is a beautiful plant, and the resemblance to a tuft of feathers is striking.



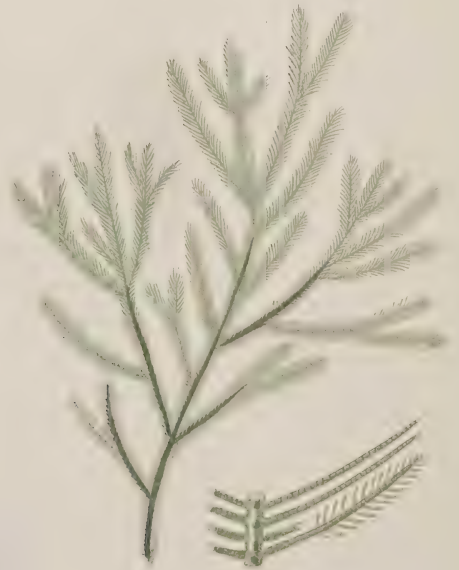
71.—*Cladostephus spongiosus*, Ag.



72.—*Sphacelaria filicina*, Ag.



73.—*Sphacelaria scoparia*, Lyngb.



74.—*Sphacelaria plumosa*, Lyngb.

PLATE XVIII.

Fig. 75. MYRIONEMA CLAVATUM.

Colour. "Nearly the colour," says Captain Carmichael, "of the then purplish crust on which it grows."

Character of Frond. "Very minute; rather convex," the threads (*filaments*) of which it is composed, club-like ("clavate"); mostly cleft in two ("bifid").

Measurement. The description does not specify.

Fructification. Minute seeds (spores) affixed to the filaments.

Habitat. Not defined.

Nothing is known of this plant beyond Captain Carmichael's description and figure, and the account is very imperfect. For the other *Myrionemas*, refer back to Plate XVI. Figs. 68, 69, 70.

Fig. 76. SPHACELARIA SERTULARIA.

Colour. Olive-green.

Substance. Rigid; but delicate.

Character of Frond. Delicately bushy, Stem and branches jointed throughout; thread-like (*filiform*). Stem slightly shaggy at base; weak and slender; irregularly branched. Branches alternate; spreading horizontally; two or three times re-branched. Angles of branching very wide.

Measurement. Scarcely 3 inches long.

Fructification. Oval seeds (spores) borne on the branchlets.

Habitat. From deep water. South of England, and North and West of Ireland. Very rare.

A smaller and slenderer plant than *S. filicina*, but Dr. Harvey hesitates about making two species of them. *S. filicina* has, however, all its angles of branching very acute and narrow; while those of *S. sertularia* are very obtuse and wide; the branching of *S. filicina* is therefore erect, that of *S. sertularia* spreading.

Fig. 77. SPHACELARIA CIRRHOSA.

Colour. Dark-brown; or rusty.

Substance. Rigid; yet not coarse.

Character of Frond. A star-like tuft, more or less dense, growing on the stems of other algæ. Jointed throughout; thread-like (*filiform*); assuming many forms. Each thread (*filament*) of the tuft, branched with short, often (but not always) opposite branchlets. There are many deviations, and the branching is more or less complicated, but *S. cirrhosa* is always a *tuft*.

Measurement. An inch or more long; often less.

Fructification. Globose seeds (spores) borne on the branchlets.

Habitat. Our coasts everywhere. On *Halidrys siliquosa* abundant; and common on numerous other plants.

A very dwarf variety has been observed by Miss Cutler, on the stems of *Desmarestia aculeata*.

Fig. 78. SPHACELARIA FUSCA.

Colour. Brown.

Substance. Rigid; but not coarse.

Character of Frond. A tuft; jointed throughout; thread-like (*filiform*). Branches long and simple, bearing a few short, occasionally *three-armed* (*trifid*) branchlets. (See Plate.)

Measurement. From 3 to 5 inches long.

Fructification. Globose seeds (*spores*) borne on the branchlets.

Habitat. Shores of Wales; Sidmouth; St. Michael's Mount, Cornwall.

Fig. 79. SPHACELARIA RADICANS.

Colour. Dull greenish-olive.

Substance. Rigid; harsh.

Character of Frond. Very short tufts spreading in patches on rocks. Tufts composed of jointed threads (*filaments*) slightly branched; sometimes upright, sometimes lying flat; sending out little fibrous roots from their lower side.

Measurement. From $\frac{1}{2}$ an inch to an inch high.

Fructification. Globose seeds (*spores*) borne on the branchlets; clustered; abundant.

Habitat. Various parts of Great Britain and Ireland. On sand-covered rocks between tide-marks. Not uncommon.

Often overlooked from its insignificance.

Fig. 80. SPHACELARIA RACEMOSA.

Colour. Olive.

Substance. Rigid; hard.

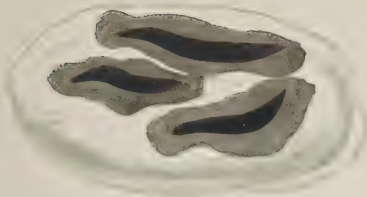
Character of Frond. Short tufts, growing on rocks. Tufts composed of jointed threads (*filaments*) branched in a forked manner (*dichotomously*).

Measurement. An inch high.

Fructification. Egg-shaped seeds (*spores*) on stalks; in clusters; several on a branchlet together (*racemose*).

Habitat. Friths of Forth and of Clyde. Very rare.

The grape-like fructification being very plentiful, there is no difficulty in recognising this plant when in fruit. It is allied to *S. radicans*, but is larger.



75.—*Sphacelaria clavatum*, *Carm.*



76.—*Sphacelaria Sertularia*, *Bonnem.*



77.—*Sphacelaria cirrhosa*, *Ag.*



78.—*Sphacelaria fusca*, *Ag.*



79.—*Sphacelaria radicans*, *Harv.*



80.—*Sphacelaria racemosa*, *Grev.*

PLATE XIX.

Fig. 81. ECTOCARPUS SILICULOSUS.

Colour. Yellowish, or a pleasant olive-green; occasionally green; sometimes rusty-brown.

Substance. Somewhat gelatinous; soft; silky.

Character of Frond. Long tufts of very slender, jointed threads (*filaments*). Filaments excessively branched. Branches irregularly set, and of various lengths; bearing a second and third set of many-times-divided branchlets; the last ones sometimes only on one side (*secund*).

Measurement. From 6 to 18 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the branches. Silicules awl-shaped; more or less finely pointed; marked with lines across (*transversely striate*); stalked.

Habitat. All round our coasts. On algæ between tide-marks. Very common.

When dried young this species has a gloss upon it. A variety, in which the *silicules* have longer stalks than usual, has been called *longipes*.

Fig. 82. ECTOCARPUS FASCICULATUS.

Colour. Varying from olive-green to brown.

Substance. Soft; but not so delicate as *E. siliculosus*.

Character of Frond. Dense tufts of jointed threads (*filaments*). Filaments branched, though not excessively. Branches distant; bearing throughout, short bundles of branchlets (*fascicles*), many times divided.

Measurement. From 1 to 3 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the branchlets. Silicules egg-shaped (*ovate*); with a more or less blunt point; marked with lines across (*transversely striate*); unstalked (*sessile*); often several close together on one side the branchlet (*secund*).

Habitat. Our coasts generally. On the larger algæ. Not uncommon.

The finely drawn out point of the silicule, here figured, is very rarely, if ever, met with. The silicules vary much in comparative width and length, but there is a tendency to bluntness at the tip, even when most drawn out.

Fig. 83. ECTOCARPUS HINCKSIÆ.

Colour. Dark-olive.

Substance. Rather harsh for an *Ectocarpus*; (like *E. littoralis*.)

Character of Frond. Slender tufts of jointed threads (*filaments*). Filaments irregularly and rather distantly branched. Upper part of branches furnished on one side with slightly curved branchlets. Branchlets furnished on their inner faces in a similar manner, so as to resemble little combs.

Measurement. From 1 to 2 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the inner faces of the last branchlets. Silicules conical. Set like buttons, one upon each joint. (See figure of the magnified branch.)

Habitat. Our coasts generally. Usually parasitical on *Laminaria bulbosa*. Filey. Not common.

The repeated *secund* branching (branches on one side the stem only) of this plant distinguishes it from all others. Several, it is true, have their ultimate branches branched *secundly*; but in no other case is the growth repeated so as to make the branchlets resemble little combs. *E. Hincksiæ* is sometimes found in company with *E. siliculosus*, but its darker tint and less glossy appearance prevent any confusion between the two.

Fig. 84. ECTOCARPUS TOMENTOSUS.

Colour. Sometimes a pleasant olive-green; oftener a dull brown; occasionally rust-colour.

Substance. Soft; spongy.

Character of Frond. Very fine, jointed threads (*filaments*) inextricably woven together into rope-like branches. Branching of the filaments irregular; chiefly alternate, on each side a stem. In some specimens the filaments being less matted than usual, the ends and sides are free, and the plant has a soft, feathery appearance.

Measurement. From 1 to 8 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the branchlets. Silicules stalked; narrow-oblong; blunt at the points.

Less matted forms of this plant bear some resemblance to very dense tufts of *E. siliculosus*; but they are always duller-looking. And there is generally some portion of each specimen, sufficiently matted and rope-like, to stamp the character of the species.



81.—*Ectocarpus siliculosus*, *Lyngb.*



82.—*Ectocarpus fasciculatus*, *Harv.*



83.—*Ectocarpus Hincksiae*, *Harv.*



84.—*Ectocarpus tomentosus*, *Lyngb.*

PLATE XX.

Fig. 85. ECTOCARPUS AMPHIBIUS.

Colour. Pale-olive.

Substance. Soft.

Character of Frond. Short tufts of very slender, jointed threads (*filaments*). Filaments branched. Branching partly forked (*subdichotomous*); the ultimate branches alternate, on each side a stem.

Measurement. From 2 to 3 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the branchlets. Silicules scattered; without stalks (*sessile*); long; narrow; almost spine-like.

Habitat. In muddy ditches of brackish water near the coast.

Dr. Harvey considers it possible that this may be but a brackish-water variety of *E. siliculosus*.

Fig. 86. ECTOCARPUS FENESTRATUS.

Colour. Pale green.

Substance. Soft.

Character of Frond. Small tufts of jointed threads (*filaments*). Filaments branched, but not much so. Branches distant; alternate, on each side a stem; re-branched with a few long, simple, alternate branchlets.

Measurement. From 1 to 2 inches long.

Fructification. In pod-like formations (*silicules*); external; scattered plentifully along the branchlets. Silicules dark-brown; narrow-oblong; stalked; densely marked with lines across (*transversely striate*), and cross-barred.

Habitat. Salcombe. (Mrs. Wyatt, once!)

This plant should be looked for further. The shape of its *silicules* distinguishes it from *E. siliculosus*, and its general character and growth from *E. tomentosus*.

Fig. 87. ECTOCARPUS DISTORTUS.

Colour. Dark-brown.

Substance. Soft; tender; soon decomposing; extremely brittle if remoistened after being dried.

Character of Frond. Large, densely matted tufts of jointed threads (*filaments*). Filaments very much branched; bent here and there in a zigzag manner, as if distorted. Branches long; spreading at wide angles; beset with short, thorn-like, but blunt branchlets; either wide-spread (*patent*); horizontal; or bent backward (*re-curved*).

Measurement. Tufts from 4 to 8 inches long.

Fructification. External seeds (*spores*) borne on the branches; more or less oval; dark-brown; unstalked (*sessile*), or but slightly stalked.

Habitat. Appin. On the shore. Parasitic on *Zostera marina*. Rare.

Fig. 88. ECTOCARPUS LANDSBURGII.

Colour. Dark-brown.

Substance. Rigid; tough; re-moistening without injury.

Character of Frond. Densely matted tufts of jointed threads (*filaments*). Filaments much branched; zigzag. Branches irregularly forked; everywhere bristling with quantities of short, straight, horizontal, thorn-like branchlets.

Measurement. Tufts from 1 to 3 inches long.

Fructification. Unknown. Probably similar to that of *E. distortus*.

Habitat. Scotland and Ireland. Lamash, Dr. Landsbrough. Roundstone Bay, Dr. Harvey. Dredged in deep water in land-locked bays. Rare.

This and the preceding species resemble each other much in general appearance and colour. But *E. Landsburgii* is more profusely and more distinctly thorny, the tips of its branchlets being pointed; its filaments are more densely opaque, and its substance is much firmer. It is only obtained by dredging; and the tufts are never so large as those of *E. distortus*.

Fig. 89. ECTOCARPUS SPHÆROPHORUS.

Colour. Dull olive-green or rusty-brown.

Substance. Soft; moderately firm.

Character of Frond. Full bushy tufts of jointed threads (*filaments*). Filaments much branched; slender; straight. Main stems somewhat matted; branches free, repeatedly divided. Upper ones either opposite or in fours (*quaternate*).

Measurement. From 1 to 3 inches long.

Fructification. External seeds (*spores*) borne on the branchlets; either opposite to each other on opposite sides of the stem, or opposite to a branchlet; occasionally in fours; unstalked (*sessile*); globose; prominent.

Habitat. Various places on our coasts, from Orkney to Cornwall. (Filey). Between tide-marks. Parasitical on the smaller algæ; chiefly on *Ptilota sericea*. Rare.

Fig. 90. ECTOCARPUS BRACHIATUS.

Colour. Pale olive-green; occasionally tawny.

Substance. Very soft; delicate.

Character of Frond. Feathery tufts of jointed threads (*filaments*). Filaments excessively branched; slender; wavy. Main stems slightly entangled; branches and branchlets free; all exactly opposite to each other on each side a stem; or occasionally in fours (*quaternate*).

Measurement. From 2 to 4 inches long.

Fructification. Seeds (*spores*) imbedded in the filaments borne on the lesser branchlets; or in the angles where two branchlets meet; forming oblong swellings.

Habitat. England and Ireland. Parasitic on *Rhodymenia palmata* in the sea; found with *Enteromorpha compressa* in ditches of brackish water. Rare.



88.—*Ectocarpus amphibius*, *Harr.*



86.—*Ectocarpus fenestratus*, *Harr.*



87.—*Ectocarpus distortus*, *Carm.*



85.—*Ectocarpus landsburgii*, *Harr.*



89.—*Ectocarpus sphaerophorus*, *Carm.*



90.—*Ectocarpus brachiatus*, *Harr.*

Fig. 91. ECTOCARPUS CRINITUS.

Colour. When fresh, "bright bay;" when dried, a dull but rather pleasant green, with a slight gloss.

Substance. Moderately firm.

Character of Frond. Tufts of jointed threads (*filaments*) lying on the mud in extensive fleecy strata. Filaments slightly and distantly branched. Branches long; nearly simple.

Measurement. Filaments about two inches long.

Fructification. External seeds (*spores*) borne on the branches. Spores globose; scattered; unstalked (*sessile*). Rarely found.

Habitat. Appin. Capt. Carmichael. Watermouth, Devonshire, Mrs. Griffiths. On muddy sea-shores. Rare.

Fig. 92. ECTOCARPUS PUSILLUS.

Colour. Pale brown; sometimes drying rather greener.

Substance. Soft; delicate.

Character of Frond. Tufts of jointed threads (*filaments*); "like pale brown wool." Filaments simple, or slightly and distantly branched; interwoven.

Measurement. About an inch long.

Fructification. External seeds (*spores*) borne on the filaments. Spores roundish oblong; often two or three together; plentifully scattered.

Habitat. South coast of England. Parasitical on several of the smaller algæ. Rare.

"A connecting link between the simpler and more branching species..... Almost always found with fruit."—HARVEY.

Fig. 93. ECTOCARPUS LITTORALIS.

Colour. Olive-brown, or olive-green; not unfrequently rust-coloured.

Substance. Soft, though coarse, when young; rigid when old.

Character of Frond. Dense, interwoven tufts of jointed threads (*filaments*). Filaments harsh when old; much and irregularly branched. Main stems often entangled; the lesser divisions free. Branches alternate, on each side a stem; branchlets often opposite.

Measurement. From 6 to 12 inches long.

Fructification. Formed in the substance of the branchlets; a portion of which becomes converted into fruit-bearing, pod-like formations (*sili-cules*), causing dark oblong swellings; the tip of the branchlets appearing beyond. (See figure.)

Habitat. All round our coasts. Parasitical on the larger algæ, &c. Between tide-marks. Very common.

Fig. 94. ECTOCARPUS LONGIFRUCTUS.

Colour. Olive-green.

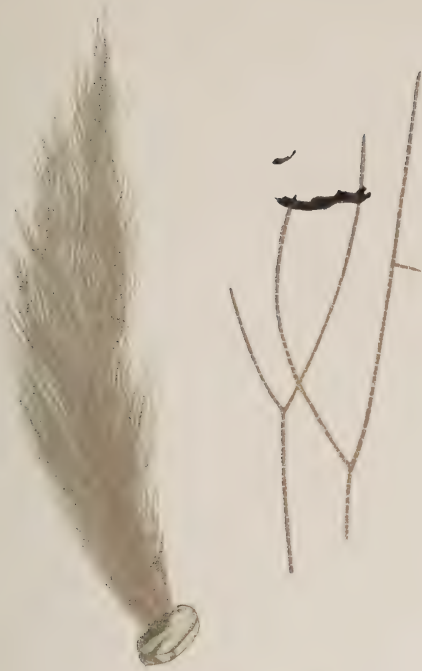
Substance. Soft, though coarse.

Character of Frond. Large tufts of jointed threads (*filaments*). Filaments robust; excessively branched. Branches mostly opposite; the lesser ones set with short, thorn-like, opposite (rarely, alternate) branchlets.

Measurement. Six inches long.

Fructification. Formed in the substance of the branchlets; a portion of which becomes converted into fruit-bearing, pod-like formations (*sili-cules*), causing dark oblong swellings; extending to the tips. (See figure).

Habitat. Orkney. Parasitical on algæ between tide-marks. Rare.



91.—*Ectocarpus crinitus*, *Carm.*



92.—*Ectocarpus pusillus*, *Griff.*



93.—*Ectocarpus litoralis*, *Lyngb.*



94.—*Ectocarpus longifructus*, *Harv.*

Fig. 95. ECTOCARPUS GRANULOSUS.

Colour. Green in youth; afterwards olive-green or yellowish.

Substance. Moderately firm; soft.

Character of Frond. Feathery tufts of jointed threads (*filaments*). Filaments much branched. Branches on each side stems; sometimes opposite, sometimes alternate; extreme branchlets often set, four or five in succession on one side (*secund*). Main divisions slightly entangled; lesser ones quite free and feathery.

Measurement. From 1 inch to a foot long. (Dependent on the depth of water.)

Fructification. External seeds (*spores*) borne on the branchlets. Spores large; oval; dark-brown; marked with lines across (*transversely striate*); minutely cross-barred; unstalked (*sessile*); abundant.

Habitat. Our shores generally. On rocks or algæ between tide-marks. Frequent.

The figure of this plant is not very characteristic. Its growth is looser and freer than the representation. There are several varieties of it, one of which is now raised to the dignity of a species, *E. tessellatus*. It is a small plant, growing in crevices of the rocks at half-tide level, and is exquisitely green when young. The *tessellated* appearance of the spores gave rise to the name. One of its characters is the *secund* growth of the extreme branchlets. Another variety, chiefly found on the south coast, is less richly branched, but all, or nearly all its branches and branchlets are *opposite* on each side the stems. Intermediate forms occur with opposite and alternate branching mixed. *E. tessellatus* was first noticed on rock-crevices on the top of Filey Bridge by Mr. Hayden; but it has been found abundantly since. Whether it has a right to a position as a species is still doubtful, but it is at any rate a very lovely variety.

Fig. 96. ECTOCARPUS MERTENSII.

Colour. A beautiful olive-green in the early part of the year, becoming browner in the summer and autumn.

Substance. Soft and delicate.

Character of Frond. Tufts of jointed threads (*filaments*). Filaments branched in a regular and remarkable manner. Main stems simple, or nearly so; set throughout with exactly opposite branches, of unequal length. Branches also simple; set throughout (and closely) with slender, spreading branchlets $\frac{1}{3}$ the diameter of the branch; except where a pair of larger branchlets takes the place of a pair of the lesser ones. Secondary branchlets similarly re-branched; the whole plant resembling a collection of delicate feathers.

Measurement. From 2 inches to a foot in length.

Fructification. Seeds (*spores*) imbedded in the branchlets, forming dark oblong swellings. (See figure.)

Habitat. Our coasts here and there from Orkney to Cornwall, and in Ireland. On mud-covered rocks and stones, near low-water mark; and at a greater depth.

Fig. 97. MYRIOTRICHIA CLAVÆFORMIS.

Colour. Yellowish-brown.

Substance. Very soft; limp; slightly gelatinous.

Character of Frond. Small tufts of jointed threads (*filaments*) fringing other algæ. Each filament quite simple; naked below; upwards densely clothed with branchlets, which gradually increase in length as they approach the tips; thus giving the frond a club-shaped form. Branchlets re-branched in a similar way; the second set bearing long colourless fibres from their tips.

Measurement. Half an inch long.

Fructification. External seeds (*spores*) borne on the branchlets; egg-shaped; dark; the transparent case (*perispore*) which encloses them, visible all round.

Habitat. Our coasts generally. Parasitic on *Chorda lomentaria*. Occasionally.

Fig. 98. MYRIOTRICHIA FILIFORMIS.

Colour. Yellowish-brown.

Substance. Very soft; limp; slightly gelatinous.

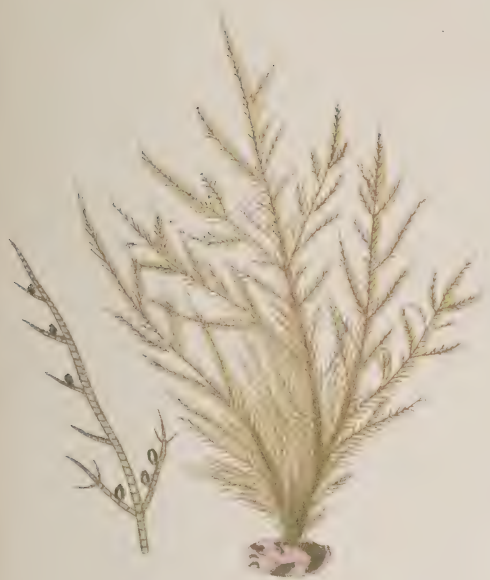
Character of Frond. Small tufts of jointed threads (*filaments*) fringing other algæ so naturally, that the combination has the appearance of being one plant. Filaments very slender; often curled; several twisted together into rope-like tufts. Each stem quite simple; at intervals looking as if thickened into dark knobs. Under the microscope these prove to be clusters of minute, stunted, oblong branchlets, from which issue the long colourless fibres characteristic of the genus.

Measurement. An inch or more in length.

Fructification. External seeds (*spores*) borne on the branchlets. Spores egg-shaped, dark; the transparent case (*perispore*) which encloses them, visible all round.

Habitat. Our coasts generally. Parasitic on *Chorda lomentaria*, and *Asperococcus echinatus*; at half-tide level. Abundant at Filey. Not uncommon.

This plant is sometimes found accompanying *M. clavæformis*; but is very much more frequently met with.



95.—*Ectocarpus granulosus*, Ag.



96.—*Ectocarpus Mertensii*, Ag.



97.—*Myriotrichia claviformis*, Harv.



98.—*Myriotrichia filiformis*, Harv.



PLATE XXIII.

Fig. 99. ODONTHALIA DENTATA.

Colour. Deep ruby-red, when growing; soon turning darker when thrown ashore; when dried, black, except very young plants, or the new shoots of old ones, which retain a reddish-pink hue.

Substance. Membranaceous, but firm and elastic.

Character of Frond. Flat; narrow; obscurely midribbed; branched. Branching alternate; irregular. Main stem simple or forked; deeply toothed on each side. Branches issuing from the axils of the teeth; narrow at the base, widening upwards; either toothed or deeply cut into narrow branchlet-like segments (*pinnatifid*). The whole frond preserving nearly the same width throughout; and at one level, as if cut out of paper.

Measurement. From 3 to 12 inches long.

Fructification. Of two kinds; external. 1. Clusters of seeds (*spores*)* contained in ovate, transparent cases (*capsules*). 2. Seeds divided into four parts (*tetraspores*), contained in lanceolate pods (*stichidia*). Scattered along the margins on slender stalks which are either simple or branched.

Habitat. Scotland. North of England and Ireland. In pools and on rocks in the sea. Frequent.

When once seen, this plant cannot be mistaken for any other; and even a study of the figure will make it easy to recognize. It was for a long time supposed to have its southern limit in the county of Durham; but it has since been found abundantly in a deep pool in Gristhorpe Bay, between Scarborough and Filey; is common at Filey, and has been picked up as low as Flamborough Head. It is magnificent in size at the Giant's Causeway in Ireland.

* N.B. For brevity's sake the reader is requested to accept this explanation of the words *Spore*, *Tetraspore*, *Capsule*, *Stichidium*, as here given once for all. The terms will be used hereafter as a matter of course.

Fig. 100. RHODOMELA LYCOPODIOIDES.

Colour. A dark-brownish red; becoming darker in drying.

Substance. Robust and elastic; young branches soft; old ones harsh.

Character of Frond. Thread-like (*filamentous*); tufted; branched; the filaments opaque. Stems long, thread-shaped (*filiform*), simple; or divided near the base into several long, simple branches; densely clothed with slender, feathery, finely-divided branchlets. These dying partially down in winter, the stems are left bristling with their stunted remains; in which condition the plant can hardly be recognized; and in the second summer, when it has thrown out fresh branchlets, the old and new growths are found together.

Measurement. From 4 to 18 inches long.

Fructification. Of two kinds; chiefly external. 1. Clustered *spores* in ovate *capsules*; external. 2. *Tetraspores* in *stichidia*, or in swollen branchlets.

Habitat. Scotland, and the North of England and Ireland. On the stems of *Laminaria digitata*. Common.

For another *Rhodomela*, see Plate XXIV. Fig. 103.

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Fig. 101. RYTIPHLÆA THUYOIDES.

Colour. A dull-brown or brownish-yellow; becoming black in drying.

Substance. Robust and elastic.

Character of Frond. Thread-like (*filamentous*); tufted; branched; the filaments opaque, closely marked with lines across (*transversely striate*). Stems thread-shaped (*filiform*); erect; rising from creeping fibres; below, naked; or set with short spine-like branchlets; above, much branched; branches close, very erect, many times re-branched, but shortly, so as always to preserve a narrow lanceolate outline.

Measurement. From 3 to 4 inches long.

Fructification. Of two kinds. 1. Clusters of *spores* in ovate *capsules*; external. 2. *Tetraspores* in distorted swollen branchlets.

Habitat. Our coasts generally. In tide-pools, frequent; but not on the N. East coast.

Fig. 102. RYTIPHLÆA FRUTICULOSA.

Colour. Dull reddish, or yellowish-brown.

Substance. Robust and elastic.

Character of Frond. Thread-like (*filamentous*); tufted; branched; the filaments opaque, closely marked with lines across (*transversely striate*). Stems forked (spreading widely) from the base; branches the same, partly forked (*dichotomous*), partly branched like a feather (*pinnate*). Angles of the branches (*axils*) rounded. Branchlets alternate; horizontal; short; so that each branch has a narrowish outline.

Measurement. From 3 to 6 inches long.

Fructification. Of two kinds. 1. Clusters of *spores* in ovate *capsules*; external (very rare). 2. *Tetraspores* in swollen branchlets (common).

Habitat. Our coasts generally. On sand-covered rocks between tide-marks. Common.

For the other *Rytiphloeas*, see Plate XXIV. Fig. 104; and Plate XXV. Fig. 108.



99.—*Odonthalia dentata*, *Lyngb.*



100.—*Rhodomela lycopodioides*, *Ag.*



101.—*Rytiphlaea huyoides*, *Harv.*



102.—*Rytiphlaea fruticulosa*, *Harv.*

PLATE XXIV.

Fig. 103. RHODOMELA SUBFUSCA.

Colour. Dark brownish-red; becoming nearly black in drying.

Substance. Rigid.

Character of Frond. Thread-like (*filamentous*); tufted; bushy; much branched; in summer everywhere clothed with minute branchlets. Filaments opaque; becoming finer upwards. Stems simple or divided; branches long, straight, simple; set with simple or re-branched branchlets, which are alternate and often crowded together above; sometimes feathery from subdivision. In winter the finer branchlets die partially down, leaving the stems irregularly clothed with stunted remains. In the following spring a fresh set arise, and on these the fructification is often produced.

Measurement. From 4 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules*; external. 2. *Tetraspores* immersed in the ends of swollen branchlets; solitary or in pairs. The black tubercles which are sometimes found on this plant are a diseased growth—not fructification.

Habitat. All round our coasts. On rocks and algæ between tide-marks. Common.

For the other *Rhodomela*, see Plate XXIII. Fig. 100. In characteristic specimens the two species are unlike enough; but intermediate varieties sometimes occur. *R. lycopodioides* is, however, a strictly north-country plant. There is a great resemblance between this genus and the next two (*Rytiphleæ* and *Poly-siphonia*), in some general points, but the microscope shows the structures of the three to be widely different.

Fig. 104. RYTIPHLÆA PINASTROIDES.

Colour. Dull red; clear when young; dark, when old; becoming black in drying.

Substance. Very firm; elastic.

Character of Frond. Thread-like (*filamentous*); very bushy; much branched. Filaments opaque; closely marked with lines across (*transversely striate*). Branching irregular. Stem nearly simple at base; much divided above; set everywhere with very short thorn-like branchlets. Branches long, simple, spreading often, slightly incurved; either alternate or on one side the stem only (*secund*); re-branched; the lesser branches set with short, straight, or slightly incurved branchlets; all turned to one side (*secund* therefore); making the branches look like so many small combs (see figure); tips often hooked in; general outline spreading and fan-shaped.

Measurement. From 4 to 8 inches long.

Fructification. Of two kinds. 1. Clustered (*spores*) in ovate *capsules*; external, on the branches. 2. *Tetraspores* imbedded in the ends of swollen branchlets.

Habitat. South coast of England. Isle of Wight, &c. Common.

A species of such peculiar growth that it is scarcely possible to confound it with any other. If a specimen be picked up from the shore and well shaken so as to disperse the water, the bushy branches will bristle out in all directions, instead of clinging together as they are apt to do in so many tufted plants. For other *Rytiphleas* see Plates XXIII. and XXV. The characteristic *lines across* (*transverse striæ*), are obvious in the younger branches, if examined through a pocket lens.

Fig. 105. POLYSIPHONIA ELONGATA.

Colour. Dark red; becoming almost black in drying, all but the finer tips.

Substance. Stems robust and firm; branchlets flaccid.

Character of Frond. Tufts of jointed threads (*filaments*) irregularly branched.

Stems as thick as whipcord; they and the branches tapering at both ends. (See figure.) Branches producing but few branchlets the first year. In winter, these and the tips of the branches die off, leaving the frond stunted, and often very unsightly till the following spring; when a new growth commences; the broken branches putting out vigorous shoots, which end in fine tufts of crimson branchlets, as figured in Fig. 106; and on these the fructification is borne. Joints marked with several upright lines (internal tubes) seen through the branchlets.

Internal Tubes. Four primary ones; several secondary.

Measurement. From 6 to 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate, stalkless (*sessile*) capsules; external; on the branches; either clustered or scattered. 2. *Tetraspores*, either imbedded in the ends of swollen branchlets, or borne in minute pod-like processes on the branches.

Habitat. Our coasts generally. On stones, shells, corallines, &c. In pools between tide-marks, and in from five to ten fathoms' water.

Although the structure is strictly jointed (*articulated*, see figure,) the articulations of the stem and *primary* branches are indistinct, from the surface cells being small and irregularly placed. For other *Polysiphonias*, see Plate XXV. &c.

Fig. 106. POLYSIPHONIA ELONGATA. VAR.

This form is no longer recognized as a variety, but merely as the second summer's condition of *P. elongata*. (See last description.) It is the var. *γ. sanguinolenta* of Agardh, and the *P. rosea* of Greville. In the same manner the bare winter condition was at one time taken for a variety, and called var. *β. denudata*.



103.—*Rhodomela subfusca*, Ag.



104.—*Rytiphlea pinastroides*, Ag.



105.—*Polysiphonia elongata*, Grev.



106.—*Polysiphonia elongata*, Var.

PLATE XXV.

Fig. 107. DASYA VENUSTA.

Colour. Rosy red; stems brownish.

Substance. Very soft; tender.

Character of Frond. Thread-like (*filamentous*); much branched. Stem long, simple, semi-transparent, unjointed. Branches alternate; the lowermost longest; the rest gradually shorter upwards, giving the front a pyramidal outline; once or twice re-branched like a feather (*pinnate*); unjointed; but clothed throughout with very slender, hair-like branchlets, which are jointed and many times forked (*dichotomous*).

Measurement. From 3 to 4 inches long.

Fructification. Of two kinds; external. 1. Clustered *spores* in ovate *capsules*, with a protruding mouth (*urceolate*, see figure); unstalked. 2. *Tetraspores* in pointed oblong, *stichidia*; stalked.

Habitat. Jersey. Cast ashore. Very rare.

Fig. 108. RITIPHLŒA COMPLANATA.

Colour. Brown-red; becoming almost black in drying.

Substance. Firm, elastic.

Character of Frond. Thread-like (*filamentous*), but compressed; much branched. Filaments opaque; closely marked with lines across (*transversely striate*). Stem erect; nearly simple below; much branched above. Branches erect, but spreading; twice or thrice re-branched, like a feather (*pinnate*); the lower branchlets always short or stunted; the upper longer, straight, rod-like; giving a stiff, formal character to the plant.

Measurement. From 2 to 3 inches long.

Fructification. Has not been found in Britain.

Habitat. South of England and West of Ireland (Miltown Malbay, in one particular pool, abundant). On the rocky beds of shallow tide-pools, exposed at low-water mark to full sunshine. Very rare.

The lines across (*transverse striæ*) characteristic of the genus, look in this species as if they were arched, but this is an optical delusion. They are best observed through a pocket lens.

Fig. 109. POLYSIPHONIA URCEOLATA.

Colour. Full red; becoming dark in drying.

Substance. Rigid; wiry.

Character of Frond. Long, dense, bushy tufts of jointed threads (*filaments*); much branched; loosely entangled. Branches partly forked (*sub-dichotomous*); partly alternate; erect, but spreading; more or less furnished with very short, alternate, spreading or back-curved (*re-curved*) branchlets. Joints marked with two broad upright lines (internal tubes seen through); or, if the filament be twisted, part of a third becoming visible.

Internal Tubes. Four.

Measurement. From 3 to 9 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in *capsules*; external. Capsules generally stalked, ovate, with a protruding mouth (*urceolate*). 2. *Tetraspores* immersed in the upper part of swollen branchlets.

Habitat. Our coasts generally. On rocks between tide-marks, or on the stems of *Laminaria digitata*. Common.

Varying very much in delicacy. Often as thick as horsehair at the base of the filaments, but sometimes approaching the slenderness of *P. formosa*. It is always more rigid in substance, however, and its short back-curved branchlets are another mark of distinction, particularly in specimens growing on *L. digitata*.

Fig. 110. POLYSIPHONIA FORMOSA.

Colour. Full red; becoming dark in drying.

Substance. Exceedingly soft and flaccid. Soon decomposing in fresh water.

Character of Frond. Long, dense tufts of jointed threads (*filaments*); exceedingly slender; much branched. Branches partially forked (*sub-dichotomous*); long; wavy; bearing a second or third series; branchlets scattered, spreading, feathery. Joints marked with two broad upright lines (internal tubes seen through).

Internal Tubes. Four.

Measurement. From 6 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in *capsules*; external. Capsules generally stalked, ovate, with a protruding mouth (*urceolate*). 2. *Tetraspores* immersed in the middle part of the last branchlets.

Habitat. Our coasts generally. On rocks, &c., near low-water mark. Not so common as *P. urceolata*.

Perhaps only a delicate and elegant variety of *P. urceolata*, but so flaccid that it is best laid out in sea-water.

Fig. 111. POLYSIPHONIA OBSCURA.

Colour. Dark brown-red; nearly black in drying.

Substance. Soft.

Character of Frond. Densely matted patches of short, very slender, jointed threads (*filaments*); creeping on the surface of rocks; attached by minute fibres which issue from the lower surface; throwing up from the upper erect or curved, simple branches; which are either naked or furnished with a few branchlets on one side (*secund*). Joints marked with many upright lines (internal tubes seen through).

Internal Tubes. Twelve or thirteen.

Measurement. Upright branches from $\frac{1}{4}$ to $\frac{1}{2}$ an inch long. Patches from 6 inches to 1 foot in extent.

Fructification. Only one kind found. *Tetraspores* immersed in swollen branchlets.

Habitat. Jersey and Sidmouth. On rocks at half-tide level. Sometimes parasitic on algæ; covering the roots of *Fuci*.

Fig. 112. POLYSIPHONIA PULVINATA.

Colour. Dull, brownish-red, or purplish; not much darker in drying.

Substance. Very soft and flaccid; soon decomposing in fresh water.

Character of Frond. Short, dense, intricate tufts of jointed threads (*filaments*); rising from a mass of creeping fibres. Filaments closely interwoven; very slender; wavy; sparingly and irregularly branched, in a forked manner (*dichotomously*); more or less furnished with small, spreading, or back-curved (*re-curved*) simple branchlets. Joints marked with two upright lines (internal tubes).

Internal Tubes. Four.

Measurement. About an inch in height.

Fructification. Of two kinds. 1. Clustered *spores* in very large, ovate, stalked *capsules*, with a protruding mouth (*urceolate*); external. 2. *Tetraspores* immersed in swollen branchlets.

Habitat. Our coasts generally. On rocks and algæ between tide-marks. Not uncommon.

This looks like a miniature *P. urceolata*, but its substance is extremely flaccid. It should be laid out in sea-water.



107.—*Dasya venusta*, Harv.



108.—*Rytiphlea complanata*, Ag.



109.—*Polysiphonia arceolata*, Grw.



110.—*Polysiphonia formosa*, Suhr.



111.—*Polysiphonia obscura*, J. Ag.



112.—*Polysiphonia pulvinata*, Spreng.

PLATE XXVI.

Fig. 113. POLYSIPHONIA FIBRATA.

Colour. Dark red-brown below; rosy above.

Substance. Tender and gelatinous; decomposing rapidly in fresh-water.

Character of Frond. Very dense tufts of jointed threads (*filaments*); much branched. Stems as thick as hog's bristles below, becoming very fine upwards; simple or alternately branched. Set at greater or less distances with very slender, forked (*dichotomous*) branchlets, more or less tufted; whose abrupt (*truncate*) tips are clothed with colourless, forked (*dichotomous*) fibres, bearing at certain seasons tiny yellow pods (*antheridia*), whose office is not thoroughly ascertained. Angles of branching (*axils*) all spreading. Marked throughout with two upright lines (internal tubes).

Internal Tubes. Four.

Measurement. From 2 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate or globose *capsules*; external; plentifully scattered. 2. *Tetraspores* immersed in the swollen upper branchlets.

Habitat. Our coasts generally. On rocks, stones, and algæ, between tide-marks. Not uncommon.

Fig. 114. POLYSIPHONIA SPINULOSA.

Colour. Dark red. *Substance.* Rigid, though fine.

Character of Frond. Short, delicate tufts of jointed threads (*filaments*) very much branched. Branching alternate. Branches spreading; irregularly set; clothed with short, straight, spreading branchlets; several times re-branched; the last set, thorn-like, and horizontally spread; their tips sometimes minutely divided; each division bearing a long, colourless, jointed thread. Joints marked by two or three upright lines (internal tubes).

Internal Tubes. Four large and several lesser ones; more of these in the branches than branchlets.

Measurement. One or 2 inches long.

Fructification. Only one sort observed. Clustered *spores* in globose, unstalked (*sessile*) *capsules*; external.

Habitat. Appin. Very rare.

A plant which, like the next, has only been found once; the solitary specimens being preserved in Sir William Hooker's Herbarium.

Fig. 115. POLYSIPHONIA RICHARDSONI.

Colour. Dull red; becoming darker in drying. *Substance.* Rigid; elastic.

Character of Frond. Small tufts of jointed threads (*filaments*) much branched. Stem, hogs'-bristle thickness at base; finer above; alternately branched throughout; the branches long, spreading, often issuing horizontally; set in the upper part with widely-spreading, straight, partly forked (*sub-dichotomous*), partly alternate branchlets. Main joints marked with several irregular lines (internal tubes), twisted.

Internal Tubes. Five.

Measurement. Three or 4 inches long.

Fructification. Only one kind observed. Clustered *spores* in globose, unstalked (*sessile*) *capsules*; external.

Habitat. Colvend, Dumfries.

Fig. 116. POLYSIPHONIA GRIFFITHSIANA.

Colour. Brownish below; above, rosy pink.

Substance. Rigid below; elastic; the branchlets soft; but not decomposing easily in fresh-water.

Character of Frond. Short tufts of jointed threads (*filaments*), very much branched. Stems hogs'-bristle thickness at base, gradually finer upwards; alternately branched throughout. Branches long, spreading; simple or divided; set with numerous, variously branched, slender, spreading branchlets; the last ones often bent back (*re-curved*). Length of joints equal throughout (which is not usual). Marked by four upright lines (internal tubes) of irregular width.

Internal Tubes. Four large, four small secondary ones.

Measurement. Three or 4 inches long.

Fructification. Only one kind observed. Clustered *spores* in broadly ovate *capsules*.

Habitat. Torquay. Parasitical on *Polydus rotundus*. Isle of Portland. Very rare.

Fig. 117. POLYSIPHONIA ELONGELLA.

Colour. Stems brownish; branchlets rose-red. *Substance.* Rigid below; soft above.

Character of Frond. Small tufts of jointed threads (*filaments*), much branched. Branching partly forked, partly alternate. Stems the thickness of a hog's-bristle below, as fine as hair above. Main branches distant; very wide-spread; more or less furnished with soft tufts of long, often-divided branchlets, which taper to the tips, but not, as in *P. elongata*, to the base also. Joints marked with two or three upright lines (internal tubes).

Internal Tubes. Four.

Measurement. From 2 to 4 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in large, ovate, shortly-stalked *capsules*; external. 2. *Tetraspores*, immersed in the middle of swollen branchlets.

Habitat. Our coasts generally; Isle of Man, West Coast of Scotland. On rocks and stones and the smaller algæ near low-water mark, and at a greater depth. Rather rare.

The winter and summer states of this plant differ as much as those of *P. elongata*, which it strongly resembles in miniature; and which it is like in the annual dying off of its more delicate branchlets (see under *P. elongata*). But there are certain marks by which the two may be distinguished. The branches of *P. elongella* do not taper to the base like those of *P. elongata*; and the joints are distinctly visible in all the main branches as well as in the branchlets. It is also a much smaller and more delicate plant in general appearance.

Fig. 118. POLYSIPHONIA CARMICHAELIANA.

Colour. Reddish brown; becoming black in drying. *Substance.* Rigid.

Character of Frond. Tufts of jointed threads (*filaments*); branched. Stem set throughout with scattered, alternate, wide-spreading branches of irregular lengths. Branches short, scattered, almost horizontally spread, irregularly forked (*dichotomous*), spine-like. Joints not visible in the stem and principal branches, but these marked with from two to four upright lines (internal tubes). Branchlets visibly jointed.

Internal Tubes. Four.

Measurement. Four inches long.

Fructification. Has not been observed.

Habitat. Appin. On *Desmarestia aculeata*. Very rare.



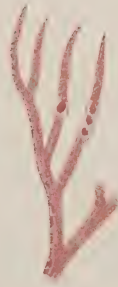
113.—*Polysiphonia fibrata*, Harv.

114.—*Polysiphonia spinulosa*, Grv.



115.—*Polysiphonia Richardsoni*, Hook.

116.—*Polysiphonia Griffithsiana*, Harv.



117.—*Polysiphonia elongella*, Harv.

118.—*Polysiphonia Carmichaeliana*, Harv.

PLATE XXVII.

Fig. 119. POLYSIPHONIA VIOLACEA.

Colour. Brownish-red or purple.

Substance. Tender; gelatinous; soon decomposing in fresh water.

Character of Frond. Thread-like (*filamentous*), solitary, or tufted; jointed; very much branched. Principal stem sometimes rather robust; sometimes much more slender than a hog's bristle; set throughout with long, irregularly alternate, four-spread (*quadrifarious*) branches, of unequal length, but gradually diminishing upwards. Branches re-branched in a similar way with two, three, and even four sets; these gradually lessening in diameter and length; so that the plant has a remarkably feathery or finely bushed character. The last branchlets exceedingly slender, and, when young, tipped with fibres. Joints of the stems indistinct; of the branchlets obvious, with two or three upright lines (internal tubes).

Internal Tubes. Four.

Measurement. From 6 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate, stalkless, or shortly-stalked, *capsules*; external. 2. *Tetraspores*, large; immersed in the swollen branchlets.

Habitat. Our coasts generally. On rocks, stones, and lesser algæ near low-water mark. Not uncommon.

Rather like *P. fibrata*, but a larger and more luxuriant plant, and not obviously jointed throughout. The cobweb-like last set of branches are sometimes a beautiful violet colour, especially when dried. It is best to lay out this plant in sea-water.

Fig. 120. POLYSIPHONIA BRODLÆI.

Colour. A dark brownish-purple or red.

Substance. Gelatinous; instantly beginning to decompose if immersed in fresh water, and giving out a disagreeable smell.

Character of Frond. Long tufts of jointed threads (*filaments*), very much branched. Stems robust, elastic, undivided, opaque. Branches numerous, alternate, rod-like; clothed with short, soft, repeatedly-divided, tuft-like branchlets, from half an inch to an inch long. Branching always alternate. Joints not visible in the stems and branches; obvious in the branchlets, which are marked with three or four upright lines (internal tubes).

Internal Tubes. About seven.

Measurement. From 6 to 14 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules*, slightly stalked; external. 2. *Tetraspores* immersed in the swollen tips of the finer branchlets.

Habitat. Our shores generally. On rocks and corallines near low-water mark. Not uncommon.

This beautiful *Polysiphonia* should always be laid out in sea-water. The first touch of fresh water destroys something of its beauty, by causing the tips of the delicate, tuft-like branchlets to decompose and break off.

Fig. 121. POLYSIPHONIA NIGRESCENS.

Colour. A dull brown, sometimes a purplish red; old plants becoming black; all, darker in drying.

Substance. Rigid below; soft and delicate above.

Character of Frond. Long tufts of jointed threads (*filaments*), very much and variously branched. Stems robust, nearly simple; sometimes set throughout with richly feathered branches. In autumn and winter rough below with broken remains; bushy above. Branches long, alternate; repeatedly re-branched in a feather-like manner (*pinnate*); the sets becoming gradually more and more slender. Branchlets short, alternate, distant below; the uppermost often crowded together; mostly simple, awl-shaped. Joints closely marked with numerous upright lines (internal tubes).

Internal Tubes. From twelve to twenty.

Measurement. From 6 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, unstalked *capsules*, with a narrow opening; external. 2. *Tetraspores* immersed in the lesser branchlets.

Habitat. All round our coasts. On rocks, stones, and algæ between tide-marks. Very common.

Summer specimens are feathery and beautiful; autumn and winter ones coarse and bushy. But, independently of this, it is one of the most variable of seaweeds. Dr. Harvey considers its "distantly pinnate" branchlets, and the great number of its tubes sufficiently characteristic marks, but he has recorded seven American varieties, and Britain could add more. In one short stiff form it assumes the characters of *Rytiphleæ thuyoides* so strongly, that nothing but the microscope can separate them. (See under *Rytiphleæ thuyoides*.)

Fig. 122. POLYSIPHONIA AFFINIS.

Colour. A dull, pale, reddish-brown.

Substance. Firm below; soft above.

Character of Frond. Long tufts of jointed threads (*filaments*) much branched. Stems as thick as bristles below; irregularly forked; or alternately branched. Branches spreading; naked at base, finely divided and ovate in outline above; lesser branchlets all naked at base; furnished above with a few very upright, alternate, or second branchlets, the lowermost longest. Joints of the stem obscure; those of the branches obvious; marked with numerous upright lines (internal tubes).

Internal Tubes. About sixteen.

Measurement. From 4 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate or nearly globose, stalked *capsules*; external. 2. *Tetraspores* large; immersed in the lesser branchlets.

Habitat. Clamlough, near Glenarm, Ireland. Cushendall, ditto. On rocks, &c. in the sea, and thrown up from deep water.

Dr. Harvey considers this almost *too* closely allied to *P. nigrescens*. Its branching is more loose, its internal tubes fewer, its colour paler, its branches more wavy, and its substance softer. Yet he could be "well contented to regard it as a deep-water form of that species." Nevertheless, figures of the typical forms of each are different. (See the figures.)



119.—*Polysiphonia violacea*, Grev.



120.—*Polysiphonia Brodiaei*, Grev.



121.—*Polysiphonia nigrescens*, Grev.



122.—*Polysiphonia affinis*, Moore.

PLATE XXVIII.

Fig. 123. POLYSIPHONIA FIBRILLOSA.

Colour. Brownish-red in deep water; pale straw in shallow pools; becoming purplish in drying.

Substance. Tender and gelatinous; soon decomposing.

Character of Frond. Thread-like (*filamentous*); solitary or tufted; jointed; very much branched. Stem robust below; becoming finer upwards; simple, or once or twice divided; naked near the base; then set throughout with short, slender, finely-divided side-branchlets, whose tips are clothed with fibres. Branches rather robust, wide-spread; of various lengths; the lowermost generally longest; sometimes simple, but usually many times re-branched, each set more slender than the last (these also, in luxurious specimens, set with short, slender branchlets); the last branchlets hair-like; their tips splitting into numerous cobweb-fine fibres (*fibrilliferous*). Joints not visible in the stem nor lower part of the branches; obvious above; marked by two or three upright lines (internal tubes).

Internal Tubes. Four.

Measurement. From 6 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, scarcely stalked *capsules*; external. 2. *Tetraspores* immersed in swollen, distorted branchlets; large.

Habitat. Our coasts generally. On rocks, stones, and algæ between tide-marks. Often in pools left by the falling tides. Frequent.

Fig. 124. POLYSIPHONIA VARIEGATA.

Colour. A dark purple-brown; brighter when dry.

Substance. Rigid below; very soft above.

Character of Frond. Dense tufts of jointed threads (*filaments*) much branched; as thick as hogs' bristles below; hair-like above. Branching forked (*dichotomous*); the lower angles of branching (*axils*) very wide-spread. Branches somewhat zigzag, long, much divided; set with tufts of very fine, delicate, closely-forked branchlets. Joints clearly visible throughout; marked by three broad, upright lines (internal tubes).

Internal Tubes. Six; sometimes, but rarely, seven.

Measurement. From 4 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, wide-mouthed, shortly-stalked *capsules*; external. 2. *Tetraspores* immersed in swollen branchlets.

Habitat. Plymouth, and various places near it. On mud-covered rocks in bays and estuaries. Also on *Zostera*, *Chorda filum*, floating timber, &c. Very local, and therefore rare in Britain. Common at Venice and in North America.

Fig. 125. POLYSIPHONIA SIMULANS.

Colour. Reddish.

Substance. Stiff and brittle.

Character of Frond. Tufts of jointed threads (*filaments*) branched from the base; bushy. Stems irregularly set with spines which hold the plant together, so that it is difficult to disentangle. Branches alternate, wide-spread, repeatedly but irregularly branched like a feather (*pinnate*); the last set but one, long and simple; set with short, distant, spine-like branchlets. Joints visible throughout; marked with many upright lines (internal tubes).

Internal Tubes. About twelve.

Measurement. From 2 to 3 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in nearly globose or ovate *capsules*, with a wide mouth; external. 2. *Tetraspores* immersed in swollen branchlets.

Habitat. Jersey. Torquay. Orkney. On rocks and in tide-pools near low-water mark. Rare.

Fig. 126. POLYSIPHONIA FURCELLATA.

Colour. When recent, a bright brick-red; turning umber-brown when dry.

Substance. At first firm, but becoming soft immediately.

Character of Frond. Very slender tufts of jointed threads (*filaments*) much entangled, wavy, excessively branched. All the branching regularly and repeatedly, and, in the upper part, very closely forked (*dichotomous*); angles of branching (*axils*) broad and rounded; branchlets upright, their points somewhat hooked in. Joints visible throughout; marked with several slender, upright lines (internal tubes) which sometimes cross each other.

Internal Tubes. About eight.

Measurement. Five or 6 inches long.

Fructification. Not found in Britain.

Habitat. South shore of England and Ireland. Jersey. Found floating or by dredging. Very rare.

Fig. 127. POLYSIPHONIA FASTIGIATA.

Colour. Dark-brown; reddish in deep water; becoming yellowish on exposed rocks left by the tide; drying quite black.

Substance. Rigid.

Character of Frond. Dense, globular tufts of jointed threads (*filaments*) excessively branched from the base. Filaments as thick as hogs' bristles, and of equal diameter throughout the plant. All the main branches forked (*dichotomous*); their angles of branching (*axils*) wide. Branchlets rather less regular; being occasionally alternate. All the tips of the same length as if they had been cut to one level (forming a circle when laid out). Joints visible throughout; marked with numerous upright lines (internal tubes); a dark central spot in each.

Internal Tubes. Sixteen or eighteen.

Measurement. From 2 to 4 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate-stalked *capsules*, with a narrow, protruding mouth; external. 2. *Tetraspores*, immersed in swollen, distorted branchlets.

Habitat. Our coasts generally. Parasitic on *Fucus nodosus*, and *Fucus vesiculosus*; but especially the former. Very common.

Fig. 128. POLYSIPHONIA PARASITICA.

Colour. A clear lake-red; becoming brownish in drying.

Substance. Rigid, but not harsh.

Character of Frond. Delicate, feather-like tufts of jointed threads (*filaments*), very much branched. Stems rather compressed; simple. Branches alternate, generally short below, longer above; once or twice re-branched like a feather (*pinnated*); last branchlets simple, awl-shaped, acute, upright, alternate, closely set. Joints visible throughout; marked with three or four lines (internal tubes) with transparent spaces between.

Internal Tubes. About eight.

Measurement. From $\frac{1}{2}$ inch to $1\frac{1}{2}$ long.

Fructification. Of two kinds. 1. Clustered *spores* in large ovate, shortly-stalked *capsules*; external (very rare). 2. *Tetraspores*, immersed in swollen, much distorted branchlets.

Habitat. Our coasts generally. Sometimes parasitic on the larger algæ. Oftener in pools near low-water mark; growing on the pink incrustations formed by *Corallinas* and *Melobesias*; where few other plants are to be seen.



123.—*Polysiphonia fibrillosa*, Grev.



124.—*Polysiphonia variegata*, Ag.



125.—*Polysiphonia simulans*, Harv.



126.—*Polysiphonia furcellata*, Harv.



127.—*Polysiphonia fastigiata*, Grev.



128.—*Polysiphonia parasitica*, Grev.

PLATE XXIX.

Fig. 129. POLYSIPHONIA SUBULIFERA.

Colour. Purplish; becoming darker in drying.

Substance. Stems elastic; branchlets soft and tender.

Character of Frond. Tufts of jointed threads (*filaments*), much branched. Stems wavy; as thick as hogs' bristles below; becoming finer upwards; once or twice divided. Branches wide-spread; wavy; of unequal lengths; irregularly re-branched; lesser branches long, rod-like; furnished with very short, scattered, simple, spine-like, almost horizontal branchlets. (See figure of a magnified bit.) Joints visible throughout; marked with from four to six upright lines (internal tubes).

Internal Tubes. About thirteen.

Measurement. Four or 5 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules*; external. 2. *Tetraspores* immersed in swollen branchlets.

Habitat. Torquay and Weymouth. Abundant in Roundstone Bay, Ireland. Dredged in from five to ten fathoms' water. Very local, therefore rare.

This species bears a greater resemblance to young specimens of *Rytiphlaea fruticulosa* than to any other plant, but is softer and more slender, and may always be distinguished by its distinctly jointed stem and branches. Its peculiarly thorny habit is so unlike any other *Polysiphonia* of the same size, that it can hardly be confounded with any. It approaches nearest to the following (*P. atro-rubescens*), but the branches are much wider spread, and the branchlets are simple, not clustered in tufts.

FIG. 130. POLYSIPHONIA ATRO-RUBESCENS.

Colour. Deep red or brownish when full grown; becoming black in drying; the lesser branches of very young specimens bright red.

Substance. Rigid when full grown; the branchlets soft when young.

Character of Frond. Dense tufts of jointed threads (*filaments*); or covering the rocks in wide patches; more or less sparingly branched. Stems thicker than horse-hair, simple or nearly so; more or less furnished with long, upright, simple branches. Branches sometimes re-branched; furnished in greater or less abundance with very short, awl or spindle-shaped, upright branchlets, scattered singly or in tufts. Joints visible throughout; marked with several lines (internal tubes); sometimes, but not always, spirally curved. Root fibrous (not usual in *Polysiphonias*).

Internal Tubes. About thirteen.

Measurement. From 2 to 6 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in nearly globose, wide-mouthed *capsules*; external. 2. *Tetraspores* immersed in swollen branchlets.

The young state of this plant is wanting in the tufted branchlets, and the tops of the branches are very soft and bright red, retaining the colour in drying. Such specimens are, however, generally found with their roots, which, being fibrous, instead of the more common disc, serve as a clue to the species. For one other *Polysiphonia*, see Plate XXX. Fig. 134.

Fig. 131. LAURENCIA PINNATIFIDA.

Colour. Properly a livid purple, or dull purplish red; but varying from that to many shades of green and yellow; the deeper the water in which it grows, the finer the colour.

Substance. Thick; elastic; fleshy; giving out a strong, disagreeable smell.

Character of Frond. Compressed; narrow; tufted; very formally branched; all the divisions as if imperfectly cut out of a flat surface (*pinnatifid*). Stems simple; from one-twelfth to one-sixth of an inch across; often tapering to the base and widening upwards; but sometimes the reverse. Branches long, alternate, upright; twice re-branched or oftener; each set one-third the length of the last; the final ones short, obtuse, simple, or divided (*lobed*). Root fibrous.

Measurement. From 1 to 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, upstalked (*sessile*) capsules; external; on the corners of the smaller divisions. 2. *Tetraspores* immersed in the branchlets.

Habitat. All round our coasts. On rocks from near high-water mark down to deep water. Common.

Increasing in luxuriance, as well as deepening in colour, the lower it grows: miserably stunted and discoloured on rocks often exposed. There are two named varieties (and many variations): *β. osmunda* and *γ. tenuissima*. In *β. osmunda* the branches are short and many times divided at the ends; in *γ. tenuissima* they are very thin, much branched and widely spread. Among variations from the character represented in the figure may be named that where the stem tapers at the base, and the frond widens so much upwards, that the cutting out of the upper branches is rather indicated than accomplished. Or instead of the lowermost branches on the stem being longest, they will sometimes be shortest, so that the plant becomes fan-shaped above. But the character of imperfectly cut out branching prevails throughout.

Fig. 132. LAURENCIA OBTUSA.

Colour. Dull, semi-transparent red at first, quickly changing to a rosy pink, which is very fleeting, and soon passes into the waxy yellow and white of decay.

Substance. Crisp when perfectly recent; soon becoming soft, and decomposing.

Character of Frond. Cylindrical; branched; tufted. Stems as thick as a sparrow's quill; undivided or somewhat forked. Branches long, irregularly set round the stem (sometimes three or four from one level); the lowermost generally longest; gradually shortening upwards; twice or thrice re-branched; each set diminishing greatly in length. Last branchlets extremely short, mostly opposite or in threes; almost horizontally set; narrowed at the base, widening upwards, blunt at top as if swollen.

Measurement. From 3 to 6 inches long.

Fructification. Of two kinds. Clustered *spores* in ovate capsules; external, on the tips of the smaller branches. *Tetraspores* immersed in the ends of the final branchlets.

Whereas the frond of *Laurencia pinnatifida* is characterized by being so entirely at one level that its branches look as if they had been cut out rather than grown, *Laurencia obtusa* is so entirely the reverse, that a fresh-gathered specimen stands out in all directions, from the fact that its branches issue at various points round the stem (fir-tree fashion). It is not often the plant is picked up otherwise than the rosy pink usually described, for the process of decay soon begins when it is once thrown ashore; but those who have met with it abundantly in its crisp condition when quite recent, are aware that the beautiful colour it assumes soon after, is the first stage of a change. It is by no means a pretty hue until exposed for a short time, or plunged in fresh water.



129.—*Polysiphonia subulifera*, Ag.



130.—*Polysiphonia atro-rubescens*, Grv.



131.—*Laurencia pinnatifida*, Lamour.



132.—*Laurencia obtusa*, Lamour.

PLATE XXX.

Fig. 133. BONNEMAISONIA ASPARAGOIDES.

Colour. Brilliant rosy red; rather darker from the west of Ireland.

Substance. Very soft and delicate.

Character of Frond. Thread-like (*filamentous*), but rather compressed; delicately, and very much branched. Stem undivided; set on each side with long, alternate branches, which are either simple or re-branched. Stem and branches fringed throughout with very slender, short, awl-shaped branchlets, regularly alternate. The whole frond at one level (*distichous*).

Measurement. From 4 to 12 inches long.

Fructification. Only one sort known. Clustered *spores* in ovate, shortly-stalked *capsules*, which are always placed exactly opposite one of the fringing branchlets.

Habitat. The milder stations on our coast. West of Scotland, Isle of Man, Devonshire, &c. Ireland generally. On rocks near low-water mark, and at a greater depth. Not very uncommon.

A variety of this most graceful plant is found at Wicklow and in Kingstown Harbour. *β. teres*. It is thoroughly thread-shaped (*filiform*) throughout, (cylindrical, *i.e.* instead of compressed;) and the fringing branchlets are very long. *Bonnemaisonia* evidently loves a genial climate, becoming more and more luxuriant in proportion to the warmth of the sea it inhabits. The slender fringing branchlets, regularly alternate, with a *spore-capsule* opposite each, when in fruit; combined with the brilliant colour, distinguish this plant from every other British species. And it is generally, if not always, in fruit when thrown ashore, which happens sometimes, in great profusion, for a few weeks during the summer.

Fig. 134. POLYSIPHONIA BYSSOIDES.

Colour. A fine clear red when young; browner when old, and after exposure to the air, or in drying.

Substance. When young and luxuriant, soft; all but the stems, which are gristly; when old, rigid.

Character of Frond. Thread-like (*filamentous*); tufted; very much branched. Stem undivided; branched like a feather (*pinnate*). Branches simple, slender, the lowermost longest; gradually shorter upwards; several times re-branched; the lesser divisions more or less densely clothed with tufts of once or twice forked, spreading, cobweb-like branchlets, which give the frond a beautifully feathery appearance. Joints visible throughout, though often difficult to observe from the crowded branchlets. Stem and branches marked with three or four upright lines (internal tubes). Branchlets single-tubed.

Internal Tubes. About eight.

Measurement. From 4 to 12 inches long.

Fructification. Only one kind observed. Clustered *spores* in ovate, stalked *capsules*; external; on the lesser branches.

Habitat. Our coasts generally. On stones and shells, and algæ near low-water mark, and in deeper water. Common.

A stunted sort of variety with the tufts of branchlets stiff, crowded, and thorn-like (not unlike the magnified branch of the variety *denudata* of *Dasya coccinea*, Fig. 135), and the whole plant a dull brown, can scarcely be recognized when compared with luxurious feathery specimens of this plant.

Fig. 135. DASYA COCCINEA.

Colour. A dull or fine crimson, becoming scarlet on exposure or in fresh water.

Substance. Elastic; firm; but turning soft and decomposing after a few hours in fresh-water.

Character of Frond. Thread-like (*filamentous*); delicately, much branched. Stems robust and rough with minute hair-like fibres; generally undivided; branched like a feather (*pinnate*). Branches simple, alternate, the lowermost longest, gradually shorter upwards; twice re-branched; the last branchlets many times forked. Stem and branches opaque; branchlets jointed.

Measurement. From 6 to 8 inches long.

Fructification. Of two kinds; external. 1. Clustered *spores* in ovate, rather pointed, capsules; at the base of the branchlets. 2. *Tetraspores* in oblong, pointed, *stichidia*.

Habitat. Our coasts generally, on rocks, &c. near low-water mark. Common.

Var. β . *tenuior* is more slender in all its parts. Var. γ has naked branches, and the branchlets are minute, nearly simple, their points turning in all directions (*squarose*). (See figure of magnified branch.) For other *Dasyas* refer back to Plate XXV. Fig. 107; and forward to Plate XXXI. Fig. 137; and Plate XXXIV. Fig. 152.

Fig. 136. CHRYSYMENIA CLAVELLOSA.

Colour. A dullish semi-transparent red when actually growing; soon becoming a beautiful brilliant pink.

Substance. Gelatinous; soft; slippery; adhering closely to paper.

Character of Frond. Bushy; thread-shaped (*filiform*); slender; much branched; tufted or solitary; tubular. Stems undivided; gradually widening from the base to the middle; thence diminishing to the end; alternately or irregularly branched. Branches long, undivided, opposite or alternate; once or twice re-branched; all the stems tapering to the base and top (*apex*); bearing one or more series of linear-lanceolate branchlets, closely set. They, as well as the branchlets, usually set at one level (*distichous*), but sometimes springing from all sides of the frond, making it a thick bush.

Measurement. From 3 to 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in conical, stalkless capsules. 2. *Tetraspores* immersed in the branchlets.

Habitat. Various stations on the coasts of England, Scotland, and Ireland. On rocks, &c. near low-water mark; and on the stems of *Laminaria*, at a greater depth. Not uncommon.

This plant is now called *Chylocladia clavellosa*, a name by which it was known many years ago. A short, very bushy variety, which cannot be laid out without a good deal of clipping of crowded branches, is to be found on the steep sides of the rocks not far from low-water mark, on the north side of Filey Bridge. It never turns the rosy pink of the larger and more usual plant; is less frequently divided, and has a tendency to bear its *tetraspores* in groups (*sori*), towards the middle and base of the branchlets. The usual (*normal*) form is very abundant, occasionally at Filey, but, like many other algæ, it is whimsical in its times of appearance. For another *Chrysymenia*, see Plate XXXI. Figs. 141, 142.



133.—*Bonnemaisonia asparagoides*, Ag.



134.—*Polysiphonia byssoides*, Grv.



135.—*Dasya coccinea*, Ag.



136.—*Chrysomenia clavellosa*, J. Ag.

PLATE XXXI.

Fig. 137. DASYA OCELLATA.

Colour. A brownish or bright purple.

Substance. Rigid for so small a plant; spongy.

Character of Frond. A delicate little bush; tufted. Stems simple or nearly so; as thick as hogs' bristles; opaque; unjointed; marked with veiny lines; densely clothed all round with short fringing branchlets which are specially crowded above, making all the tips strikingly round and blunt. Branchlets slender, erect, several times forked; jointed throughout.

Measurement. One or 2 inches high.

Fructification. Only one kind found in England; viz. *tetraspores*, in long, slender, pointed *stichidia*.

Habitat. South of England and Ireland. On mud-covered rocks near low-water mark. Rare.

Fig. 138. CHYLOCLADIA REFLEXA.

Colour. Purple or dull red.

Substance. Soft, membranaceous; not distinctly gelatinous.

Character of Frond. Small; creeping; oddly bent and branched. Lower branches cylindrical, slender, arched, tubular; attaching themselves to the rock, by tiny branchlets, tipped with discs. Secondary branches springing from the arched ones; very irregularly placed (sometimes three from one point), tapering at both ends; contracted at intervals as if drawn in; the joints so formed about once and a half as long as broad; sometimes bearing a few scattered, curved branchlets.

Measurement. Two or 3 inches high.

Fructification. Of two kinds. 1. Clustered *spores* in globose, unstalked (*sessile*) capsules; external. 2. *Tetraspores* immersed in the smaller branches.

Habitat. South and west coasts of England; Ireland, generally. On rocks near low-water mark.

Now *Lomentaria reflexa*. Dr. Harvey considers this a variety of *C. Kaliformis*.

Fig. 139. BOSTRYCHIA SCORPIOIDES.

Colour. Dull purple, becoming blackish in drying.

Substance. Elastic; but tender.

Character of Frond. Entangled tufts of slender threads (*filaments*), whose tips are more or less tightly curled in (like those of a young fern); very much branched. Branches very wide-spread; wavy; furnished with a second or third set, equally spreading; the uppermost with their tips turned in (*involute*). The whole frond set, at intervals, with short, many-times-divided branchlets; almost horizontally spread.

Measurement. Four or 5 inches high.

Fructification. Only one kind observed in England; viz. *Tetraspores* in lanceolate *stichidia*; external; borne either on the sides or ends of the branches. Very rarely found.

Habitat. Certain stations only on our coasts. Muddy sea-shores, near high-water mark; at the estuaries of rivers; in salt-water marshes and ditches, adhering to the roots of flowering plants; said also to grow on submarine rocks. Very local; therefore rare.

Fig. 140. LAURENCIA CÆSPITOSA.

Colour. Dark livid-purple in deep water; greenish-yellow when exposed to sunlight.

Substance. Thickish; elastic; fleshy feeling.

Character of Frond. Cylindrical or nearly so; as thick as a crow's quill; nearly one width throughout; formally branched; tufted. Stems simple; generally naked below; much and stiffly branched above; forming a pyramidal outline. Branches erecting; spreading; the main ones often opposite; the lesser alternate; quite cylindrical. Branchlets often much crowded; sometimes simple, sometimes much branched, alternately; always very erect; slightly tapering to the base; blunt and abruptly cut off at top.

Measurement. From 2 to 8 inches high.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, unstalked (*sessile*) capsules; external. 2. *Tetraspores* immersed in the branchlets like dots.

Habitat. Our coasts generally, within tide-marks. Common.

Fig. 141. CHRYSYMENIA ROSEA. Var. ORCADENSIS.

Colour. Bright rosy-red.

Substance. Delicately membranaceous.

Character of Frond. Flat; leaf-like; narrow-oblong; pointed; tapering to a thin stem (sometimes abruptly); furnished on each side with exactly opposite, narrow-oblong, leaf-like branchlets; which now and then have the rudiments of a third set. One or many from a root.

Measurement. From 1 to 3 inches high.

Fructification. Only one kind ascertained. *Tetraspores* collected into groups (*sori*), imbedded in the surface of both leaves and leaflets.

Habitat. Skail and Sanda Frith, Orkney. On rocks and *Laminaria digitata* in deep water.

Now *Chylocladia rosea*.

Fig. 142. CHRYSYMENIA ROSEA.

The description above given applies equally to this plant, except that the "narrow-oblong" shape is narrower in *Chrysymenia rosea vera* than in the Orkney variety; and in this respect it closely resembles the American plants which Dr. Harvey found and named before the species was discovered in this country. *C. rosea* has many more habitats than *C. Orcadensis*. Filey, in crevices of rocks on the north side of the bridge, and on the stems of *Laminaria digitata* washed ashore in the bay; Firestone Bay, near Plymouth; the break-water under the Hoe; and the shores of Mount Edgecombe, are among its stations; by which it would appear that the lovely little plant is not particular about the climate it inhabits. A drawing in the *Brodie Herbarium* figures a plant of similar formation, except that the secondary leaflets are very narrow and very much drawn out, and in one or two cases (if a professedly "exact" copy may be trusted), bluntish at the tips. But specimens of much the same, and quite as extravagant peculiarities, were picked up at Filey in 1850, where the plant now figured was found; and have occurred elsewhere; it is to be presumed, therefore, that, like many other algæ, *C. rosea* is subject to vagaries of growth; and that Professor Arnott is right in believing the now lost plant from which the drawing was made, to have been *Chrysymenia rosea vera*.



137.—*Dasya ocellata*, Harv.



138.—*Chylocladia reflexa*, Lamour.



139.—*Bostrychia scorpioides*, Mont.



140.—*Laurencia caespitosa*, Lamour.



141.—*Chrysimenia rosea*, var. Harv.



142.—*Chrysimenia rosea*, Harv.

PLATE XXXII.

Fig. 143. LAURENCIA TENUISSIMA.

Colour. Pale purplish or pinky-red; soon becoming yellow.

Substance. Very tender; somewhat gelatinous, though when fresh, elastic.

Character of Frond. Thread-like (*filamentous*); very slender; cylindrical; much branched; tufted. Main stem generally undivided; bearing numerous, alternate, spreading, wavy branches of unequal length; some of the longest bearing a second series; and all set with numerous, very short, slender, bristle-like, simple branchlets, which taper finely to each end.

Measurement. From 6 to 8 inches long; $\frac{1}{24}$ of an inch in diameter!

Fructification. Of two kinds. 1. Clustered *spores* in ovate, unstalked *capsules*; external on the branchlets. 2. *Tetraspores* imbedded in the fringing branchlets.

Habitat. South of England and Ireland. Jersey. Isle of Wight. On rocks between tide-marks; generally in shallow pools about half-tide level. Very rare.

Slenderer than all the other *Laurencias*, and distinguishable from all by the fact of its branchlets tapering finely at *both* extremities, though more especially at their base. The figure does not give the bending delicacy of the real plant, but the magnified portion is good. An old name has been given back to this species: *Chondria tenuissima*.

Fig. 144. LAURENCIA DASYPHYLLA.

Colour. Pale-red or pink; sometimes tinged with brown; fading to yellow or green.

Substance. Somewhat gelatinous; soon decomposing.

Character of Frond. Thread-like (*filamentous*); slender; though not nearly so much so as *L. tenuissima*; cylindrical; much branched; tufted. Main stems generally undivided; bearing opposite or alternate branches; the lowermost longest, and frequently bearing a second set; all set with numerous short, club-shaped branchlets, tapering to the base, but blunt at the tips (*obtuse*).

Measurement. From 4 to 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules*; external on the lesser branches. 2. *Tetraspores* imbedded in the branchlets.

Habitat. Shores of England and Ireland. On stones and shells in pools near low-water mark, generally where the surface is covered with sand or mud. Frequent.

The blunt tips of the branchlets in this species distinguish it from *L. tenuissima*. Both are remarkable for being marked throughout, at short distances, with lines across (*transverse striae*). These are visible under a good pocket lens in the younger parts of the frond; though but faintly, generally. It is the internal structure showing through, which causes the appearance. This plant is now called *Chondria dasyphylla*.

Fig. 145. CHYLOCLADIA OVALIS.

Colour. Properly dark-red; discolouring green and brown as it grows old. Stems darker than the leaf-like branchlets.

Substance. Stems succulent, but firm and elastic; branchlets tender.

Character of Frond. Slender, thread-shaped (*filiform*), solid stems; bearing leaf-like, tubular branchlets; tufted; stems naked below; once or twice forked above. Branchlets leaf-like; more or less narrow-oval; tapering at the base; usually simple, but occasionally contracted as if jointed; clustered, or scattered; often densely crowded.

Measurement. From 2 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in globose, unstalked (*sessile*) capsules; with a wide transparent border; external on the branchlets. 2. *Tetraspores* imbedded in the branchlets.

Habitat. Southern and western shores of England and Ireland. Western Isles of Scotland. Within tide-marks. Local, therefore rare.

Dr. Harvey describes it as luxuriant on the west coast of Ireland in the months of April and May, when its colour is good and its delicate branchlets in full perfection. But the plant is short-lived. "Two months later," he says, "its aspect is completely changed; great multitudes of the fronds have perished, and those that remain are faded in colour, with attenuated and more compound ramuli. By the end of August the plant has almost entirely disappeared." Now *Lomentaria ovalis*,—Agardh's name, not Dr. Harvey's, who considers it a true *Chylocladia*.

Fig. 146. CHYLOCLADIA KALIFORMIS.

Colour. A fugitive pink, or purplish-red; soon changing to greenish-yellow.

Substance. Soft and somewhat gelatinous.

Character of Frond. Cylindrical; tubular; constricted at intervals into long joints; profusely branched. Stems undivided, tapering to each extremity; the contractions at intervals of half an inch or more. Branches, springing from each joint-contraction; opposite, or set all round the stem (*whorled*); of the same construction as the stem, only slenderer and more regularly contracted; these contractions also furnished with sets of lesser branches and branchlets, all more or less distinctly jointed, and tapering at each end.

Measurement. From 4 to even 18 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in globose, unstalked (*sessile*) capsules, with a transparent border; external on the young branches. 2. *Tetraspores* imbedded in the branchlets.

Habitat. Southern and western shores of England; west of Scotland; Ireland generally. On rocks, &c. between tide-marks and in deeper water. Not uncommon.

Now *Lomentaria kaliformis*. Variable in luxuriance and general appearance, but always retaining its characteristic growth, more or less. For varieties see Plate XXX. Fig. 151; and Fig. 153 for another *Chylocladia*.



143.—*Laurencia tenuissima*, Griseb.



144.—*Laurencia dasyphylla*, Griseb.



145.—*Chylocladia ovalis*, Hook.



146.—*Chylocladia kaliformis*, Hook.

Fig. 147. CHYLOCLADIA ARTICULATA.

Colour. A fine pinky red.

Substance. Soft, membranaceous; somewhat gelatinous.

Character of Frond. Bushy; much branched; tufted; tubular; strongly constricted throughout at intervals, into longish, inflated joints. Main stems forked (*dichotomous*), bearing branches which issue from the constrictions on each side, or all round the stem (*whorled*). These branches also forked, and bearing from their constrictions opposite or *whorled* branchlets; often very much crowded above.

Measurement. From 1 to 6, or occasionally 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in bluntly conical *capsules*; external. 2. *Tetraspores* imbedded in the joints of the branchlets.

Habitat. Our coasts generally. On rocks, &c. between tide-marks. Common.

For other *Chylocadias*, see Plates XXXI, XXXII, and XXXIV.

Fig. 148. CORALLINA OFFICINALIS.

Colour. Purplish or lilac when recent; varying to pinky, or brick-dust red; fading to milk-white.

Substance. Hard and stony, like coral; but flexible at the joints; exceedingly brittle, when dry.

Character of Frond. Bushy; tufted; much branched; in thick clumsy joints. Stems simple, bearing stiff, straight, upright, mostly opposite branches of sometimes very unequal lengths. Branches once or twice re-branched. Branchlets exactly opposite, and of regular lengths, giving a feathery outline to each division. Lower joints cylindrical, as long as broad; upper shorter, somewhat wedge-shaped but rounded, and with blunt shoulders. Branchlets cylindrical, with blunt or knobbed tips.

Measurement. From 2 to 6 inches high, rising from a wide-spread, lilac-red crest.

Fructification. Only one kind known. Clustered *strings of spores* in urn-shaped or oval *capsules*; external; at the tips of the branches or scattered on the sides.

Habitat. Our coasts generally. On rocks between tide-marks, generally in rock-pools, fringing and covering both sides and bottom.

Varying very much in the luxuriance and even character of its branching; most luxuriant in deep water. The structure is that of a vegetable growth incrustated with lime.

Fig. 149. CORALLINA SQUAMATA.

Colour. Purplish or lilac when recent; varying to pinky or brick-dust red, fading to green or milk-white.

Substance. Hard and limy, like coral; but flexible at the joints; exceedingly brittle, when dry.

Character of Frond. Bushy; tufted; much branched in thick clumsy joints. Stems simple, bearing stiff, straight, upright, mostly opposite branches of sometimes very unequal lengths. Branches once or twice re-branched. Branchlets exactly opposite, and of regular lengths, giving a feathery outline to each division. Lower joints cylindrical, scarcely longer than their breadth; upper, twice as long; flatter, wider, and more distinctly wedge-shaped than those of *C. officinalis*; with sharp, prominent shoulders. Branchlets very slender, with acute tips.

Measurement. From 1 to 6 inches high; rising from an expanded lilac-red crust.

Fructification. Only one kind known. Clustered *strings of spores* in urn-shaped or oval *capsules*; external; at the tips of the branches, or scattered on the sides.

Habitat. South coast of England and west of Ireland. On submarine rocks at the extremity of low-water mark. Not common.

Closely resembling *C. officinalis*, but they may be distinguished by a careful observation of the upper joints of the stem and branches; which in *C. squamata* are "broad and flat, with unusually sharp angles."

Fig. 150. DELESSERIA ANGUSTISSIMA.

Colour. Dark-red.

Substance. Firm; but membranaceous.

Character of Frond. Thread-like (*filamentous*); tufted; excessively branched. Stems cylindrical below, compressed above. Branching very irregular; partly forked (*dichotomous*); partly alternate. Branches at one level throughout (*distichous*); of unequal lengths; much divided above, and furnished with numerous forked branchlets.

Measurement. From 4 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in globose *capsules*; imbedded in the tips of the branches, or in small side-branchlets. 2. *Tetraspores* in groups (*sori*) either in the swollen tips or in narrow side-branchlets.

Habitat. North of Scotland and east of England. (Filey.) Parasitical on the stems of *Laminaria digitata*.

Those who have had the opportunity of seeing much of this plant cannot fail to accept Dr. Harvey's judgment, that it is but an extremely narrow variety of *Delesseria alata*. At Filey the most strikingly intermediate specimens are to be found.



147.—*Chylocladia articulata*, *Grev.*



148.—*Corallina officinalis*, *Linn.*



149.—*Corallina squamata*, *Park.*



150.—*Delesseria angustissima*, *Griff.*

Fig. 151. CHYLOCLADIA KALIFORMIS.

These are but varieties of the plant represented in Plate XXXII. Fig. 146. The one to the left with branches wide-spread, and mostly opposite, is *β. patens*. The other clothed with *quadriferous* horizontal branchlets, is *γ. squarrosa*. (See under Fig. 146.)

Fig. 152. DASYA ARBUSCULA.

Colour. Pale reddish-brown; sometimes deep red.

Substance. Soft and tender.

Character of Frond. A very delicate little bush; tufted. Stems as thick as a fine hog's bristle; much and irregularly branched; sometimes forked (*dichotomous*), sometimes furnished with wavy, more or less spreading, alternate branches, which are several times re-branched, and all densely clothed with slender fringing branchlets. Branchlets short, forked, horizontally set, giving the stems a roundish bottle-brush appearance; crowded at the tips as in *D. ocellata*.

Measurement. From 2 to 4 inches high.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules*, which have a long cylindrical mouth; external, on the branchlets. 2. *Tetraspores* in pointed oblong *stichidia*.

Habitat. South of England (Plymouth, &c.). Ireland and Scotland. Very fine at Bantry. On rocks at the verge of low-water mark. Not common.

A more slender variety, with more regularly forked branching, is obtained by dredging. Alike as this pretty little plant and *Dasya ocellata* are to each other in general look, they may easily be distinguished on careful examination. The stems of *D. ocellata* are usually quite simple, and in shape like a peacock's feather; or else slightly branched in the upper part; while those of *D. arbuscula* are profusely branched either in a forked manner, or with alternate branches which are more than once re-branched. The fringing branchlets are common to both species, but those of *D. arbuscula* are not above one-sixth of an inch in length.

Fig. 153. CHYLOCLADIA PARVULA.

Colour. A fine but fugitive pinky-red.

Substance. Soft and somewhat gelatinous.

Character of Frond. Slender; tubular; constricted at intervals into somewhat inflated joints; much branched and entangled. Branches irregular; alternate, or *secund*; of various lengths; with or without scattered branchlets, which taper slightly to the base. Joint-contractions as long as broad. Root a mass of fibres.

Measurement. Two or 3 inches long.

Fructification. Of two kinds. 1. Masses of *spores* in conical *capsules*; external; seated (*sessile*) on the branchlets. 2. *Tetraspores*; imbedded in the same.

Habitat. South of England. Not uncommon on the shores of Ireland and west of Scotland.

Now *Champia parvula*.

Fig. 154. JANIA RUBENS.

Colour. Lilac when recent; changing to pinky or brick-dust red; fading to green or milk-white.

Substance. Hard and stony, like coral; but flexible at the joints. Exceedingly brittle, when dry.

Character of Frond. Dense tufts of slender branches; their tips trimmed to one level (*fastigiata*). Branching forked (*dichotomous*). Branches erect or spreading; gradually tapering upwards; cylindrical; jointed. Joints at the base very short; the upper ones gradually longer.

Measurement. From $\frac{1}{2}$ to 1 or 2 inches high.

Fructification. Only one kind known. Clustered *strings of spores* in urn-shaped *capsules*; external, the last joint of a branchlet being transformed into one; generally with a very slender branchlet springing from each shoulder, like horns, or the feelers (*antennæ*) of a butterfly.

Habitat. Our coasts towards the south. Parasitical on the smaller algæ between tide-marks. Common.

Fig. 155. JANIA CORNICULATA.

Colour. As in *Jania rubens*.

Substance. As in *Jania rubens*.

Character of Frond. As in *Jania rubens* with respect to general appearance and branching, but no further. In *J. corniculata* the joints of the principal branches are compressed and wedge-shaped, tapering to the base; the shoulders sharp and prominent, and often prolonged into a pointed horn-like branchlet (not figured in the Plate). Last branchlets cylindrical; joints of the principal branches from two to three times as long as broad; of the last branchlets very short.

Measurement. One or 2 inches high.

Fructification. As in *Jania rubens*.

Habitat. Southern shores of England and Ireland. Isle of Wight; Jersey, &c. Parasitic on the lesser algæ. Not uncommon.

Fig. 156. MELOBESIA CALCAREA.

Colour. When fresh, deep blood-red; soon passing into brick-dust colour; fading to milk-white.

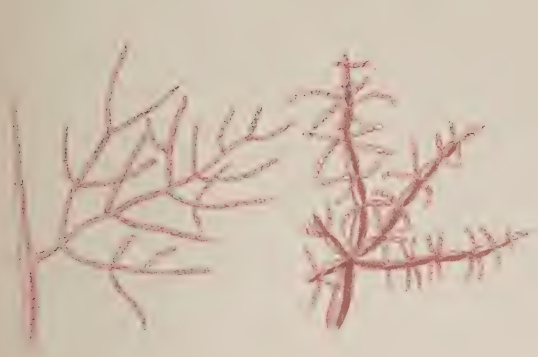
Substance. Hard, stony, and limy; solid.

Character of Frond. Loose, irregular-shaped lumps, very much branched; like an old stunted tree in miniature. Main branches forked (*dichotomous*), two sometimes uniting in one as they grow (*anastomosing*). Branchlets standing out in all directions; simple; forked; or three-pronged.

Measurement. From 1 to $2\frac{1}{2}$ inches high.

Fructification. Only one kind known. Clustered *strings of spores* in round, but rather depressed *capsules*, scattered about the frond.

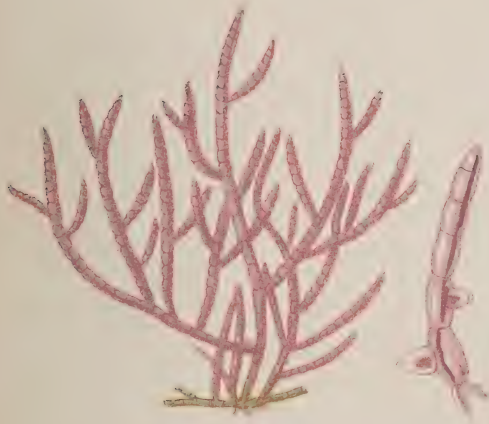
Habitat. South of England and west of Scotland and Ireland. On shingly or sandy shores in from five to fifteen fathoms' water.



151.—*Chylocladia kalifornis*, *W. A.*



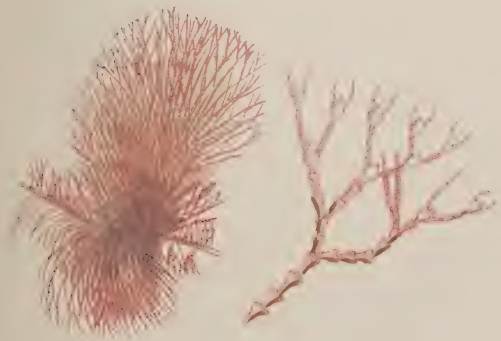
152.—*Dasya arbuscula*, *Ag.*



153.—*Chylocladia parvula*, *Hook.*



154.—*Jania rubens*, *Lamour.*



155.—*Jania corniculata*, *Lamour.*



156.—*Melobesia calcarea*, *Ell. et Sol.*

Fig. 157. MELOBESIA POLYMORPHA.

Colour. A dull purple; fading to red, yellow, greenish, or ash-coloured.

Substance. Hard, stony, limy, solid.

Character of Frond. Irregular lumps, attached to rocks by a narrow base. Of various shapes and sizes; sometimes furrowed like the kernel of a walnut; sometimes rising into short, clumsy, imperfectly developed branches. When fresh from the sea, covered with slime.

Measurement. From 1 to 3 inches high.

Fructification. Only one kind known. Clustered *strings of spores* in minute, round, but rather depressed *capsules*, seated on (*sessile*), and scattered over, the frond; numerous.

Habitat. South coasts of England, and west of Scotland and Ireland. On rocks, stones, and shells between tide-marks. Common.

Fig. 158. MELOBESIA FASCICULATA.

Colour. A dark lurid purple; soon fading in the air.

Substance. Hard, limy, solid; less stony than *M. polymorpha*.

Character of Frond. Loose irregular lumps; roundish; furrowed; branched. Branches thick, short, clumsy, with broad, blunt, forked ends, somewhat hollowed out.

Measurement. From 1 to 3 inches across; about 2 high.

Fructification. Only one kind known. Clustered *strings of spores* in round, somewhat depressed *capsules*; seated on (*sessile*), and scattered over, the frond.

Habitat. Several places on our coasts. Chiefly south and west. Lying at the sandy bottom of the sea in from four to five fathoms' water.

Fig. 159. MELOBESIA AGARICIFORMIS.

Colour. Pale flesh-colour when fresh; fading to white.

Substance. Hard, limy, solid; but thin and brittle.

Character of Frond. A loose globular mass, composed of thin, leafy, semicircular expansions (like those of an old-fashioned cap-frill), twisted and curled into close folds; as the foliations spread, the central portion rots away, so that the mass is hollow.

Measurement. From 4 to 8 inches. The lump sometimes as large as a man's fist, or larger.

Fructification. Only one kind known. Clustered *strings of spores* in conical *capsules*; *sessile** on the frond.

Habitat. Roundstone Bay, Connemara. Lying on the sandy bottom of quiet bays in from two to three fathoms' water. Very rare.

* *Sessile*—unstalked—scated upon—as “every tub on its own bottom.” It is surely needless to persist longer in *translating* so simple a word?

It is to be remarked that a *spherical* (*i. e.* globose, *i. e.* round-as-a-ball) capsule, when so seated, sometimes becomes *hemi-spherical*; and this is the case with the globose capsules of the *Melobesias*, which are also often depressed on the surface.

Fig. 160. MELOBESIA LICHENOIDES.

Colour. Pale-lilac, or rather *mauve*.

Substance. Hard; stony; solid; but thin and extremely brittle.

Character of Frond. A lichen-like expansion, composed of thin, circular, leafy plates, one above another; attached to rocks by a central base. The foliations generally free at the margins; often overlapping each other (*imbricated*).

Measurement. From 1 to 5 inches across.

Fructification. Only one kind known. Clustered *strings of spores* in large, conical, prominent *capsules*; *sessile* on the frond.

Habitat. Cornwall and west of Ireland. On rocks and in tide-pools near low-water. Not uncommon.

Fig. 161. HILDENBRANTIA RUBRA.

Colour. Bright, or sometimes dull red.

Substance. Gristly-membranaceous.

Character of Frond. A thin, skin-like film, forming a circular or irregular red patch; adhering by its under surface to the rock.

Measurement. Indefinite. From 1 to 6 inches, or thereabouts, in extent.

Fructification. Only one kind known. *Tetraspores* in round cavities, sunk in the frond.

Habitat. Our coasts generally. On smooth stones and pebbles between tide-marks. Common.

So thin that it looks merely like a red stain on the stone. When in fruit its surface is pitted with small disc-like depressions, underneath which lie the spore-cavities (*conceptacles*). The figure of the cavities gives more the appearance of raised capsules; but *concavities* are difficult to represent.

Fig. 162. HAPALIDIUM PHYLLACTIDIUM.

Colour. White.

Substance. Thin; limy; brittle.

Character of Frond. Minute dot-like patches, which, under the microscope, prove to be composed of one or several thin fan-shaped, watery fronds.

Measurement. The dots from $\frac{1}{12}$ to $\frac{1}{6}$ of an inch across.

Fructification. Unknown.

Habitat. Malahide, Dublin, and elsewhere. Parasitic on *Chrysomenia clavellosa* and other small algæ.

A very remarkable little plant, and said to be common; but, if so, it wants looking for. It was, until lately, known as *Lithocystis Allmanni*. (See Harvey's *Manual of Br. Mar. Algæ*, 2d edition, p. 111: 1849.) It is now (1862), by many, believed to be the young of a *Melobesia*.



157.—*Melobesia polymorpha*, *Linn.*



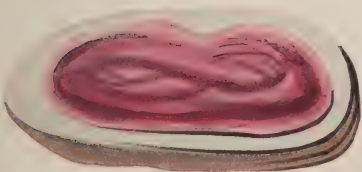
158.—*Melobesia fasciculata*, *Harv.*



159.—*Melobesia agariciformis*, *Harv.*



160.—*Melobesia lichenoides*, *Bork.*



161.—*Hildenbrandtia rubra*, *Meneg.*



162.—*Hapalidium Phyllactidium*, *Kütz.*

PLATE XXXVI.

Fig. 163. MELOBESIA MEMBRANACEA.

Colour. Pale-lilac (*mauve*); becoming white.

Substance. So thin as to be almost membranaceous, although limy; the colour of the sea-weed on which it grows, seen through.

Character of Frond. Minute, dot-like; parasitic; circular at first; several running together by degrees (*confluent*), forming irregular patches on the plant on which it grows.

Measurement. From $\frac{1}{24}$ to $\frac{1}{12}$ of an inch in diameter; patches $\frac{1}{2}$ an inch or more in extent.

Fructification. Only one kind known. Clustered *strings of spores* in round, but somewhat depressed *capsules*, with a hole at the top; *sessile* on the frond; usually one or two.

Habitat. Our coasts generally. On the leaves of *Zostera marina* (the sea-ribbon), *Phyllophora rubens*, *Chondrus crispus*, &c. Common.

The microscope shows the surface of this plant to be beautifully tessellated (something like that of *Hapalidium phyllactidium*, which, as before stated, is now suspected to be only a very young state of one of the *Melobesia* family). More or less all the *Melobesias* have the same appearance.

Fig. 164. MELOBESIA FARINOSA.

Colour. Very pallid *mauve*; becoming white.

Substance. Thin, but thicker than *M. membranacea*, limy, the colour of the sea-weed on which it grows, not seen through.

Character of Frond. Very like *M. membranacea*, only larger and thicker, and of more uncertain outline; forming irregular patches on the plant on which it grows.

Measurement. From $\frac{1}{4}$ to an inch across.

Fructification. Only one kind known. Clustered *strings of spores* in round prominent *capsules*, with a hole at the top; *sessile* on the frond; usually two or three.

Habitat. Our coasts generally. On various algæ. Common.

Fig. 165. MELOBESIA VERRUCATA.

Colour. Very pallid *mauve*; becoming white.

Substance. Thin; limy; but thicker than either of the preceding.

Character of Frond. An expanded crust; uncertain in outline; forming irregular patches on the plant on which it grows.

Measurement. Patches from $\frac{1}{4}$ to an inch or more in extent.

Fructification. Only one kind known. Clustered *strings of spores* in innumerable small, round, pimply *capsules*, with a hole at the top; seated (*sessile*) on the frond.

Habitat. Our coasts generally; chiefly south and west. On *Phyllophora rubens*.

"Looks like a still more advanced stage of *M. membranacea*." (HARVEY.)

Fig. 166. MELOBESIA PUSTULATA.

Colour. Dull-purple, or green.

Substance. Thickish; limy; smooth.

Character of Frond. An expanded crust; uncertain in outline; oblong or divided; forming irregular patches on the plant on which it grows; the largest form of the sort.

Measurement. The patches 1 or 3 inches in extent.

Fructification. Only one kind known. Clustered *strings of spores* in numerous large, rather prominent, round, conical *capsules*, with a hole at the top; *sessile* on the frond.

Habitat. Our coasts generally; chiefly south and west. On *Phyllophora rubens* and other algæ. Common.

Dr. Harvey has little doubt that the four last-described *Melobesias* are but differently advanced developments of one species. Dr. Johnston went further still, considering them all but imperfect developments of *Corallina officinalis*; whose base, it will be remembered, is a thin, circular, limy patch of a purplish or pinky colour.

Fig. 167. STENOGRAMME INTERRUPTA.

Colour. Rose-red; very clear and pinky.

Substance. Membranaceous; more rigid below than above.

Character of Frond. Flat, fan-shaped or semicircular in general outline. Rising from a short stalk; deeply cut from the base into narrow slips (*lacinia*); or the lower portion undivided, the upper slit. (See figure.) *Lacinia* repeatedly forked (*dichotomous*) slightly widening upwards; their tips blunt. Root, a disc.

Measurement. From 3 to 5 inches long; and about the same in width across the whole frond.

Fructification. Of two kinds. 1. Minute *spores* immersed in the frond in dark, narrow, nerve-like lines; running through the centre of each *lacinia* like a midrib. 2. *Tetraspores* in dark groups (*sori*) scattered on the surface. Very rare in Britain.

Habitat. Plymouth and Cork harbours, and a few stations on the south coast of England. Washed ashore or dredged. Attached to stones in from five to ten fathoms' water. Very rare.

Fig. 168. GRACILARIA ERECTA.

Colour. Pale or full red.

Substance. Elastic; rigid; not adhering to paper.

Character of Frond. Stiff, upright, tufted; slightly branched. Stems cylindrical; slender; simple, or once or twice forked (*dichotomous*). No branchlets, or very rarely. Fruiting in winter.

Measurement. One or 3 inches high.

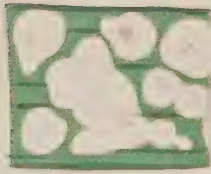
Fructification. Of two kinds. 1. A mass of minute spores in globose *capsules* clustered together; external. 2. *Tetraspores*, contained in little pod-like branchlets at the ends of the branches.

Habitat. South coast of England. The flat bottoms of shallow rock-pools, near low-water mark. Also in from four to five fathoms' water. Very rare.

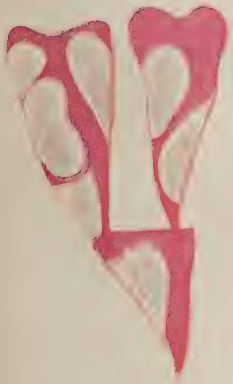
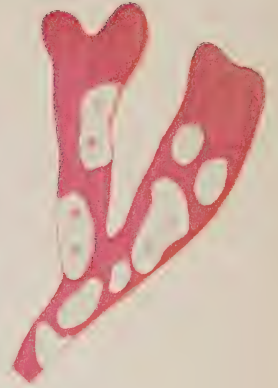
"When in perfect fructification this little plant is easily recognised," says Dr. Harvey, "the clustered tubercles and lanceolate, pod-like tips being very strikingly characteristic."



163.—*Melobesia membranacea*, *Lamour.*



164.—*Melobesia farinosa*, *Lamour.*



165.—*Melobesia verrucata*, *Lamour.*



166.—*Melobesia pustulata*, *Lamour.*



167.—*Stenogramme interrupta*, *Mont.*



168.—*Gracilaria erecta*, *Grv.*

Fig. 169. DELESSERIA SANGUINEA.

Colour. Blood-red so soon after exposure that it is generally picked up that colour; but when perfectly fresh a clear transparent moroon. Becoming brilliant after an hour or two's pressure, and retaining its fine cactus-hue in the herbarium, quite unchanged by years. The plate represents a plant which, having been picked up red, has faded, under pressure, to pink.

Substance. Delicately membranaceous all but the stem and midribs, which are firmly elastic.

Character of Frond. Stem and branches bearing strongly midribbed, distinctly veined leaves. Stem thick, solid, cylindrical; simply or slightly branched; darker than the leaves. Leaves oblong, more or less pointed; sometimes obtuse; their margins curled, but quite whole (*entire*). Midribs and side-veins prominent; the former occasionally furnished with leaflets. (See figure.) Fruiting in winter. Root a disc.

Measurement. Leaves from 2 to 8 inches long; from 1 to 6 wide. Frond varying from a few inches to a foot in height.

Fructification. Of two kinds; external. 1. A mass of *spores* in globose, stalked *capsules*; borne in winter on the skeleton midribs of the summer's leaves from which the membrane has died away; and which thus become the stems of the next year's plant. 2. *Tetraspores* in small, special, stalked leaflets, fringing the skeleton midribs.

Habitat. Our coasts generally. On rocks, *Laminaria* stems, and in pools, at or near low-water mark, and deeper. Common.

This charming plant, of whose beauty the eye never wearies, is happily not rare. It should be looked for in the early summer, before it is torn or disfigured by zoophytes. The cruel necessities of science have caused it to change its name, and by no means for the better. The old friend must be introduced to its admirers now as "*WORMSKIOLDIA sanguinea*."

Fig. 170. DELESSERIA SINUOSA.

Colour. A deep fine red; purplish when dry. Much duller at all times than the preceding.

Substance. Delicately membranaceous, all but the stems and midribs, which are elastic and firm, though slender.

Character of Frond. Stem and branches, bearing distinctly midribbed and veined leaves. Stem slender, cylindrical, once or twice branched. Leaves oblong at first; spreading irregularly afterwards; deeply and variously cut in (*pinnatifid*); often like an oak-leaf; sometimes more regularly, as in the figure. (See figure.) Margins toothed or jagged. Midribs occasionally producing leaflets, as in *D. sanguinea*.

Measurement. From a few inches to a foot high. Leaves of every variety of size.

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules*, imbedded in the midribs of the leaves. 2. *Tetraspores* in minute leaflets fringing the margins and midribs.

Habitat. Our coasts generally, but preferring the north. On the stems of *Lam. digitata*, and on various substances in deep water. Not uncommon.

A more variable plant in general appearance than the preceding. When old, and a set of skeleton branches with a few stunted leaves upon them, it can hardly be recognised. A broad-leaved specimen is a very beautiful object.

Fig. 171. DELESSERIA ALATA.

Colour. A deep red.

Substance. Side-wings membranaceous; midribs elastic and firm.

Character of Frond. Stems and branches winged with a delicate membrane on each side; nowhere furnished with distinct leaves. But in luxuriant specimens, the winged membrane has side-veins, similar to those of a leaf. Stem compressed; several times forked (*dichotomous*); or excessively but irregularly branched. Margins whole (*entire*). Tips often cleft, and overlapping.

Measurement. Frond from 3 to 8 inches high. Branches from $\frac{1}{12}$ to $\frac{1}{3}$ of an inch wide.

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules*, imbedded in (but prominent above) the midribs; towards the extremity of the branchlets. 2. *Tetraspores* imbedded either in minute leaflets springing from the midrib either at or near the tips, or in the tips themselves. Leaflets springing from the midribs.

Habitat. Our coasts generally. On rocks; the stems of *Laminaria digitata*, and other large algæ, and in from four to ten fathoms water. Common.

So different in the width of the winged membrane that the young student may easily be led to suppose that he has got hold of a different species in the different varieties. Sometimes from the abundance of leaflets growing out of the midribs the whole upper part of the frond is thick and bushy. Refer back to Plate XXXIII. Fig. 150, for *Delesseria angustissima*, which is suspected to be only a narrow variety of *D. alata*.

Fig. 172. DELESSERIA HYPOGLOSSUM.

Colour. A fine pinky red, soon given out in fresh-water.

Substance. Delicately membranaceous.

Character of Frond. Composed entirely of leaves growing from leaves; the younger from the midribs of the older, in several series; so that the *tout ensemble* in full-grown specimens is globose. Leaves linear-lanceolate, tapering at each end; margins whole (*entire*). Midribs distinct; side-veins faintly marked; transparent. Branchlets springing from the midribs.

Measurement. Most variable. Leaves sometimes $\frac{1}{2}$ of an inch wide; sometimes $\frac{1}{3}$ an inch. Fronds from an inch to $\frac{1}{2}$ a foot high.

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules*, immersed in (but prominent above) the midribs of the leaflets. 2. *Tetraspores* forming linear groups on each side of the midrib.

Habitat. Our shores generally. On rocks and algæ. Not uncommon, though rare in Scotland.

At Cushendall, Co. Antrim, the frond grows from three to four feet long. But this is a very unusual size. Even in the narrowest varieties, however, the character of the species is preserved; *i. e.* the growth of the leaves from the midribs of others; a peculiarity the figure does not make sufficiently clear, as the leaflets there have the appearance of springing from the margins of the preceding set, which is not the case. *D. hypoglossum* cannot be confounded with any other plant, with the exception of *Delesseria ruscifolia*; but *D. hypoglossum* is of a brighter colour; thinner; and its leaves are longer and narrower in proportion, and pointed instead of obtuse at the tips. For another *Delesseria* see Plate XL. Fig. 182, where the characteristic growth of that species and the present is better given.



169.—*Delesseria sanguinea*, *Lamour.*



170.—*Delesseria sinuosa*, *Lamour.*



171.—*Delesseria alata*, *Lamour.*



172.—*Delesseria hypoglossum*, *Ag.*

June, 1879.

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